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ABSTRACT

Presentation topics of the 28th annual American Industrial Arts Association Convention include: (1) "Where We Are in Federal Legislation Programs," (2) "Frontiers in Industrial Arts Education," and (3) "Industry's Cooperation with Education." Eleven symposia were conducted on the topic of "Implementing Frontier Ideas in Industrial Arts Education by Teachers, Supervisors, and Teacher Educators." The eight special interest sessions included presentations on frontiers in the Industrial Arts Areas of Automotive and Power Mechanics, Drafting, Electronics, Graphic Arts, Crafts, Metals, and Woods. Other presentations included: (1) "How We Get the Industrial Approach Into Industrial Arts In Our Region," (2) "Requirements in Other Fields that Implicate Industrial Arts," (3) "The Nature of Doctoral Programs in Industrial Arts--What The Profession Believes," and (4) "The Recruitment of Future Industrial Arts Teachers." Business Portions of the convention are also included. (GEB)

FRONTIERS IN INDUSTRIAL ARTS EDUCATION

28th ANNUAL CONVENTION

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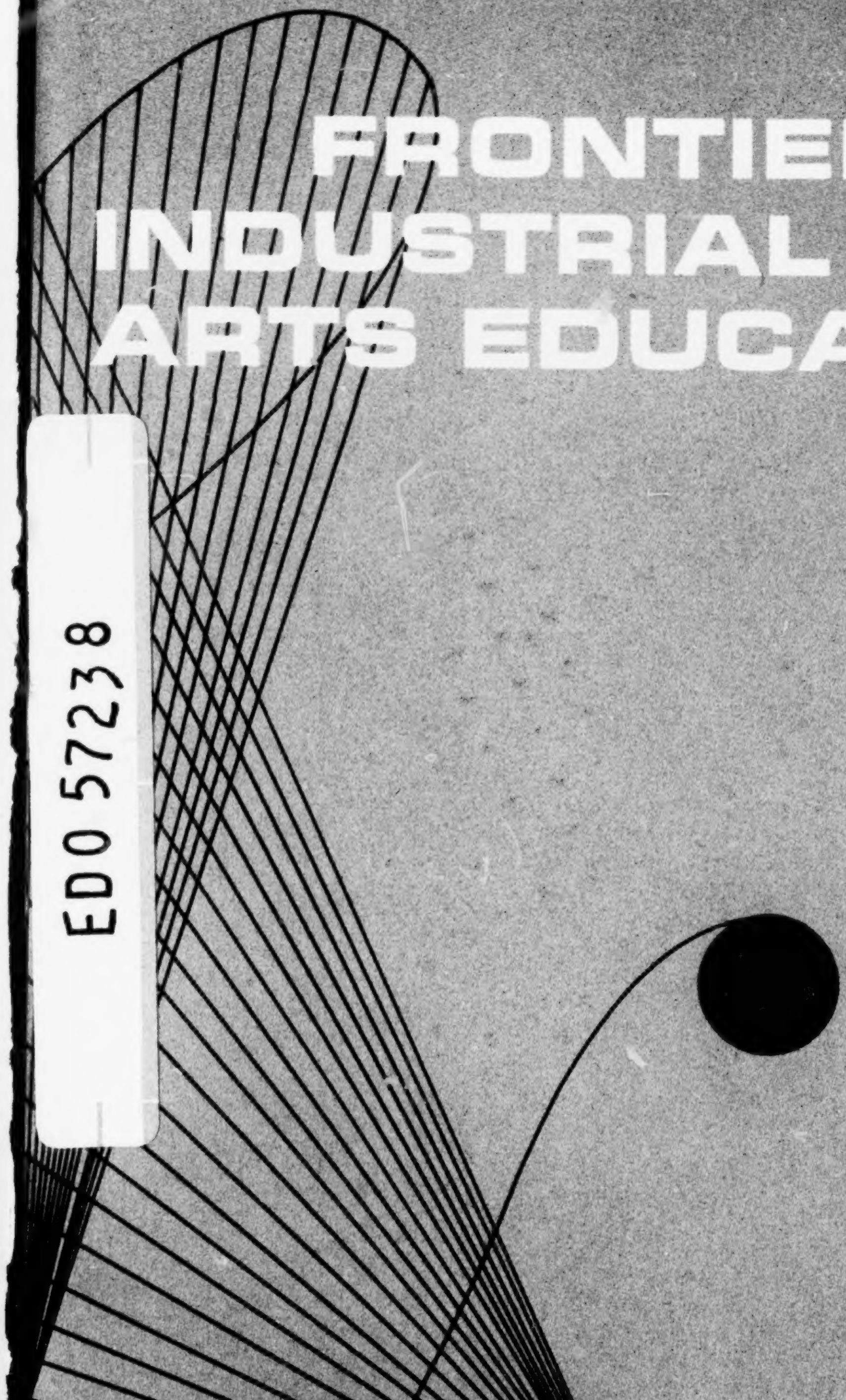

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Frontiers in Industrial Arts Education

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San Francisco, 1966*

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Where We Are in Federal Legislation Programs

ALBERT L. ALFORD

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Washington, D. C.

I would like to give you some indication of where we are in federal legislative programs in education, what we are trying to do in connection with administrative proposals, and indicate what we may expect in the future. First let us put the federal educational programs in perspective. We have had a great expansion in education legislation in recent years, which can be described in two ways: one through the indication of dollars, and the other through the actual programs.

The growth that has taken place in dollar terms can be illustrated by the growth of the U. S. Office of Education's budget. This budget doubled in the period of fiscal year 1964 to fiscal year 1965. It doubled again in the fiscal year 1965 to fiscal year 1966, and we are currently operating on a budget of about 3½ billion dollars per year. This does not mean that the U. S. Office of Education in itself has grown this rapidly, because most of the money involved here is distributed to the states and localities. There has been quite a growth in staff, and we have faced problems of organization and reorganization in terms of meeting the needs of these new federal programs. Our proposed educational program for the fiscal year 1967 will not continue at the same rate as in the past, but current proposals now before Congress would result in a net increase of approximately 329 million dollars for fiscal year 1967. While this may seem small in comparison to happenings in the past two years, it is still more than we were spending altogether for education programs less than a decade ago.

In order to bring this into perspective, we might emphasize that the federal government, in spite of the great increase in the amount of money available, still accounts for a small proportion of the total educational expenditure in this country. Our educational enterprise today is running at a rate of about 40 billion dollars a year, and the share of the federal government is still a small portion of the total. The bulk of the educational enterprise remains at the state and local level.

There is another approach we may take to examine the happenings of the last few years. Let's examine some statistics and note the programs under which the federal government operates. Well over 100,000 students from low income families are attending college under work-study programs this year. It is estimated that four out of five of these students would not be able to attend college without this assistance. Approximately 7,800,000 students are enrolled in federally aided vocational and technical schools. This represents a 30 percent increase over last year. About 125 vocational and technical schools were constructed with the aid of the 1963 Vocational Education Act. These schools will accommodate as many as 400,000 students annually when they are completed. One out of 17 college students is receiving help from the National Defense Student Loan Program. Almost 900,000 students in 1700 colleges will soon have borrowed almost 800 million dollars under this program, which began in 1958. Six thousand graduate students are working toward doctorates under the National Defense Education Act Graduate Fellowship Program. This represents an increase of 40 percent over last year. Approximately one half million students will benefit from undergraduate facilities now being built by 460 colleges and universities. Also under construction are 26 new community colleges and technical institutes, to benefit 50,000 students. Some 360 public libraries are being built under the Library Services and Construction Act of 1964. It is estimated this will benefit some 23 million Americans. The major piece of legislation that was passed last year, the Elementary and Secondary Education Act, is now in operation and will be extending benefits to approximately five million educationally disadvantaged children under Title I. Several million textbooks and library books will be purchased under the library provisions of ESEA. We can also expect an extended quality in education through the Supplementary Centers and Services Program. Over 500 projects have already been approved under this particular title, and there will be more before the end of the fiscal year. This is not to mention several hundred million dollars in programs which operate through our Impact Area Program and various other titles of the NDEA. These figures may convey an idea of the variety of activities which the federal government is supporting. I believe these activities may be considered vital to our educational community.

This rapid increase has taken place over approximately the last 2½ years. We have a history of federal legislation for education dating back to a period prior to our Constitution, but in the past 2½ years about 23 pieces of education legislation have been passed and signed into law. These include the Higher Education Facilities Act of 1963, the Vocational Education Act of 1963, the Manpower Development and Training Act of 1963, the Library Services and Construction Act of 1964, the Elementary and Secondary Education Act of 1965, the National Foundation for the Arts and Humanities Act of 1965, the National Vocation Student Loan Insurance Amendments, and the Higher Education Act of 1965. This year the Congress has passed its first piece of education legislation, the Cold War GI Bill. This is a substantial list and is indicative of the variety of activities now being supported in the education field by the federal government. Although tremendous progress has been made and a number of programs are currently underway, we cannot assume the job is done. There are many areas which are still weak and require support in the field of education.

Congress has a number of other areas of interest, for example, the construction of elementary and secondary classrooms, sabbatical programs for elementary and secondary school teachers, programs to provide specialists in child development in the pre-school years of education, the training of semi-professional workers to act as librarians, teacher aides, welfare aides, and others. Problems of school health, nutrition, physical and mental difficulties have received the attention of Congress, and there is interest in legislation in this field. There are also various types of tax credits, reductions and exemptions for the expenses of education and training. There has been some interest in revision of the National Defense Education Act titles, such as opening Title III for additional subject areas to be included in the benefits for materials and supplies. In many of the programs, such as the Title XI institutes, the demand has far exceeded the supply. Also, it will be of interest to learn whether the programs are meeting the needs of the local communities.

I would like to emphasize, in connection with these proposals, the role of industrial arts in recent education legislation. As you know, industrial arts does participate under the institute program in Title XI of the NDEA. The Manpower Development Training Act and other items of legislation all have their impact on programs in industrial arts. The Elementary and Secondary Education Act of 1965 does not provide for particular subject areas, but industrial arts has a role to play in most of the titles of this particular act. Title I involves programs for the educationally deprived child in poverty, and the industrial arts program could be embodied as a part of the local school district's program in this area. Under Title II books, library resources and journals can be oriented to industrial arts as well as other areas. Title V supports state departments of education, and the states should look into the situation of industrial arts.

Now we will summarize the proposals which have been introduced into the Congress on behalf of the present administration. There are four basic bills, only one of which represents new legislation, namely, the International Education Act of 1966.

The Elementary and Secondary Education Amendments of 1966 includes several parts. One part represents a renewal of the authorizations under the Elementary and Secondary Education Act of 1965. All of the titles under that act, or the authorizations of the titles, expire on June 30, 1966, so if the programs are to continue Congress must renew the authorizations. So we have introduced as a part of this bill a request to renew and in almost all instances to increase the authorizations. Title IV of this legislation is the Cooperative Research Title, which is a continuing piece of legislation, and the Elementary and Secondary Education Act simply provided a five-year, 100 million dollar grant for the building of educational laboratories. This was not new legislation, as were the four other titles. In addition to the renewal of the program, we are recommending certain modifications, for instance, increasing the authorizations. The amounts spent under Title I would remain essentially the same. But there is an unusual method of authorization under Title I in that no specific sum is authorized, but rather built into a formula for distributing funds. We will not fully know the difference until we see how the program is operated this year and how it would operate next year, since we expect full utility in fiscal year 1967. In Title II, the authorization is being increased from 100 million dollars to 105 million dollars. In Title III, for Supplementary Centers, the authorizations would be increased from 100 million dollars in 1966 to 150 million dollars in 1967, with hopes that the full amount would be appropriated. Title V is raised from 17 million dollars to 22 million dollars available for state departments of education in their support programs. In addition, we are asking for inclusion of some new groups. Under Titles I, II and III it has been requested that Indian children enrolled in Bureau of Indian Affairs schools be covered and a count made for this purpose. We also hope to cover migratory children under Title I, Elementary and Secondary Education Act, since they represent a large poverty group in this country.

The Congress directed in 1965, a study of the Federal Aid Impact Program. The Stanford Research Institute, located in California, undertook the study and a report was submitted to Congress. Based on their recommendations, along with some other technical amendments, the result is a reduction in the amount of money to be expended for this program. The level of authorization for this year is about 416 million dollars, and for the fiscal year 1967 it would be about 183 million dollars.

The second bill that the administration has proposed is the Library Services and the Construction amendments of 1966. The Library Services and Construction Act of 1964 expires this year, and the request is for renewal of the act. They would increase the amounts of money for Library Services from 25 million to 27½ million, and would maintain the same level for Construction at 30 million. We would, however, ask for a five-year program. The extension of four additional years is requested because one of the basic problems in this particular act is that administrators at the local level wish to be assured that the programs will be continued. A generalization at this point might be that the administration is moving in the direction of preferring five-year terms in legislation so that the states and localities may effectively plan for their education needs.

The third act which is being proposed is the Higher Education Amendments of 1966. This can be summarized by saying that we are asking for a renewal of the Higher Education Facilities Act of 1963. We would continue for the next year, at least, at essentially the same level of participation as for fiscal year 1966, with an increase in the loan program that would be available to the institutions of higher education for construction. We have asked also for an amendment to the National Defense Education Act by changing the procedures under Title II to allow a shift of the student loan program into the private sector. There is no intention of modifying the program in any way as far as benefits to students are concerned, but under Title IV of the Higher Education Act of 1965 there was introduced a massive loan program which extends benefits to middle income students and subsidies for students from families with net incomes of up to 15 thousand dollars a year. This proposal would continue the movement of financing into the private sector. This is based on a theory that financing is handled better by the financial community, since schools and colleges are not in the lending business. But there is no intention of reducing any of the benefits. It is simply a shift in the method of financing the program.

Title III of the Higher Education Act, which deals with strengthening developing institutions, expires this year, and we are asking for a renewal of this program at a higher rate. This title assists weaker and smaller institutions to achieve a quality level in order to meet the burgeoning enrollments in higher education by establishing cooperative arrangements whereby they may draw on the talent and experience of leading colleges and of business, and industry. We certainly need full use of the facilities that are possible under this act.

The fourth and final act is the International Education Act of 1966. This piece of legislation is a result of the statement of the President at the Smithsonian Centennial celebration, and it represents the only legislation currently before Congress in the education field as far as administration is concerned. One part of this act would provide grants for the purpose of establishing graduate centers for research and training in international studies. A second part would provide grants to plan, develop, and administer activities to strengthen and improve undergraduate instruction in international studies through grants to institutions of higher education. There would also be a broadening and liberalization of Title VI of the National Defense Education Act, which now provides for foreign language and area studies. This would be a modification of an existing act. In addition, there are about seven other proposals which the President has made in the field of international education, but all of these would be carried out by administrative modifications through existing authority.

We have appeared before the committees for all of these legislative items in the House of Representatives. The next step, so far as the House is concerned, will be a committee review and the issuing of a report for the Rules Committee. Then it can come before the floor of the House of Representatives. The piece of legislation in the field of international education is closer to completion than any of the other pending items. As far as the Senate side is concerned, Senator Morse has held hearings on the Elementary and Secondary Education Amendments, but there have been no hearings on the three other pieces of legislation.

Now we may take a moment to consider the reaction of Congress to the administration proposals. You may be aware of the criticism of the proposals. The interesting thing is that the criticism is oriented to the fact that we are not asking for enough money. It should be remembered, however, that we are asking for a net increase of approximately $329 millions in these proposals. This is more than we were spending for all of our programs less than a decade ago, so we feel there is a moderate and a justifiable increase in the programs for the fiscal year 1967.

The requests of the administration would have been larger this year if it had not been for the Vietnam crisis and for the accompanying threat of inflation. We are all aware of the present tendencies toward inflation. There are those who maintain, many of them in Congress, that we can provide both for Vietnam and for our domestic needs. However, it is the considered judgment of those persons in the administration who carry the responsibility for the over-all consideration of federal programs and the state of the economy that this cannot be done without serious danger of inflation. Rises in the cost of living are symptoms of this, and it would be a shallow victory if the appropriations were increased substantially only to have the net gains of these appropriations completely wiped out by the effects of inflation on the total program of education throughout the country. While we would not request a slow-down in administration proposals for this reason, the U. S. Office of Education can well use this time to attempt to consolidate the programs which have been passed in recent years. Adjusting administratively to these vast new programs has been a problem, and I think we can use a year of moderate increase to advantage.

Now I would like to comment on the ways in which legislation is passed. Both the administration and the Congress are interested in ideas which will lead to the strengthening of American education. One of the functions of professional associations is to make such ideas known. I should like to emphasize that ideas, whatever they may be and in whatever field, require support of information and facts which will show that the ideas are sound and will make a major contribution to our educational system. Given sufficient political power, it is possible to pass weak or bad education legislation, but neither the Congress nor the administration, much less the educational community, want this to happen. It is relatively easy to get legislation introduced at the state level or at the federal level. It is more difficult to get it passed. While there are exceptions to the rule, it is easier to get legislation considered and passed if it has the stamp of approval of the administration. There are good reasons for this, aside from the point of possible political influence of a chief executive. Administration approval means that the proposal has received a close scrutiny by many persons at the expert and technical level and at the policy level, and the idea does represent a responsible approach to meeting the needs of education. While the Congress may not always agree with the details of a proposal, it will usually agree that if it has received the administration's approval, it is sufficiently significant to at least conduct hearings and give it further consideration.

We tend to think that the needs of our own special area are in the interest of society, and are perhaps the most important needs of society. Now we in the U. S. Office of Education are always receptive to ideas, but it should be understood that we are not always convinced of the effectiveness of such ideas. We have the same experience internally ourselves in that some of our proposals are not received with approval at the higher echelons. But as we move to higher echelons, where the responsibilities are greater, different perspectives are produced. We must all keep working toward the goals that we desire, and we must not abdicate from our efforts because of the possibility that our ideas might not be well received.

At the federal level there has been a general tendency to follow what is called a categorical approach; that is, we select a specific need in education and attempt to support that particular need. This tendency is now changing. An illustration is Title III of the NDEA, which includes specific subject matter areas. In 1964, when this came up for renewal, the administration took the view that they would prefer to have flexibility from an administrative point of view so that when there was a need for a new subject matter area to be supported, this could be done under a broad authorization rather than have it specifically mentioned in the law. We can note the experience under the Vocational Education Program to illustrate some of the problems we have in freezing in certain subject matter areas. The Vocational Education Act of 1963 is a broad act. There is authority to change the whole pattern of vocational education in this country, but we have built in some ideas and concepts through the long history of support for particular occupations which have been difficult to overcome and to modify. We must note, in the final analysis, that Congress still finds it easier to pass categorical aid legislation. One of the reasons is that they have a relatively sharp focus on needs when they are dealing in specific categories. When generalized terms are used, it is harder to arrive at the facts. However, I believe we will have more efforts toward general support in the years to come. We may have to approach this through what might be described as broader categorical aids. For example, the construction of elementary and secondary schools is a categorical aid, but in itself it is a broad type of aid. The same thing is true of support of pre-school programs.

Whatever the method, there is no doubt that education legislation will continue to be introduced. I can assure you that education enjoys a position of first priority in the eyes of the administration. All of the persons I have had contact with have shown a dedication to improving our educational system. The legislative activities of recent years speak louder than words in support of this thesis. We can certainly expect continued progress through the newly strengthened partnership of local, state, and federal governments in this most vital of endeavors. ■

Implications for Industrial Arts in Federal Legislation

KENNETH E. DAWSON

Executive Secretary-Treasurer, American Industrial Arts Association
Washington, D. C.

Specific implications for industrial arts in the field of legislation indicate that we have at last managed to get one foot in the door. This is significant. On November 8, 1965, President Johnson signed into law the Higher Education Act which amended the National Defense Education Act to include industrial arts in Title XI, the institute section.

If industrial arts could have one item of legislation, Title XI might well be the one selected. For, indeed, we must have qualified people, and we must raise our profession to the very utmost in modern approaches to industrial arts in methodology, content and ideas. Getting our people into schools to further their education in their chosen field is most important, and the assistance of the United States Government is now available.

Now a bit of history in connection with the institutes for the summer of 1966. Possibly because of time differences across the nation, I have had my sleep disturbed on numerous occasions along the lines of the following example. Late one night the telephone rang and someone said, "Ken, we are disturbed about the NDEA institutes, that everyone didn't get one." My answer was that a formal explanation would be forthcoming at the convention, and here it is.

In November, after the Higher Education Act was signed, the U. S. Office of Education invited fifteen people to Washington to write guidelines for industrial arts institutes. The guidelines written by this group were accepted by the U. S. Office of Education and a document compiled, which has now been published. The guidelines contain specific information and ideas on how industrial arts institutes may be conducted. The entire field, from below the baccalaureate degree to the post doctorate, can be helped. The universities with pilot institutes for the summer of 1966 are five. These are The University of North Dakota; The State University College at Oswego, New York; Northern Illinois University, Eastern Michigan University, and The University of Maryland.

How were these five selected? First, the bill was for the fiscal year 1967. There were no dollars for the current year. However, with the good effort of Dr. Don Bigelow of the U. S. Office of Education and others it was possible to find a little over two million dollars, enough to provide some institutes on the pilot basis. As you know, the bill was extended to include not only industrial arts but civics and economics as well.

How can tax dollars which are applicable to all people be spent on such a limited basis? On January 24th, 25th, and 26th, the American Industrial Arts Association held a leadership conference in Washington, at which time Dr. Bigelow was invited to discuss with us the possibility of establishing a few pilot programs for the summer of 1966. There were present approximately 100 leaders in industrial arts, representing many colleges and universities and most of the states of the union. Dr. Bigelow presented this idea: Much good would be accomplished if five pilot institutes could be selected by the profession and by the U. S. Office of Education with the good will of the field and without any adverse reaction. It was agreed by the leaders who attended to abide by Dr. Bigelow's idea that the authors of the guidelines and certain other specified leaders would be asked to present names of schools capable of and desiring to hold institutes on a pilot basis during the coming summer. All of the schools represented at the leadership conference who desired to have a pilot institutes were invited to present a proposal. Twelve proposals were received, readers were called in by the U. S. Office of Education, and five were selected from the twelve. This is standard procedure. The same procedure will be followed next year, except that all colleges and universities can submit proposals.

It might be well to stress certain points for the benefit of complainants. The U. S. Office of Education suggested a plan to serve as a genesis and the plan was endorsed by leaders in industrial arts. The five institutes we do have exceed expectations, as we should actually have had none this summer. Now, there is a capable man with a Ph.D. in industrial arts on the staff of the U. S. Office of Education, assigned to the institute section. This came about as a result of the preliminary work done on the institutes.

May 2, 1966, is the deadline for having proposals into the U. S. Office of Education for the fiscal year 1967. I have been asked to estimate how many proposals will be received. My estimate is there will be between 125 and 160. It is hoped that the industrial arts field will not let us down, because this is not a categorical title once you are accepted. Last year there were 32.5 million dollars for the institutes. There will be 50 million dollars for fiscal 1967. But the dollars are not allocated to any particular area of education. Those with the best proposals and the greatest need will get the awards. I urge you, in the colleges, to submit the best possible proposal and to keep in mind the May 2nd deadline. Finally, next year it is hoped we will have from 50 to 75 summer institutes for industrial arts across the nation. So much for Title XI.

Now we will proceed to Title III of NDEA. As you know, we have been working on this title for almost two years. This was the beginning of our efforts in the area of federal legislation. This is, perhaps, the most difficult title to enter because it carries a great deal of money. It may be difficult for us to achieve a breakthrough here because industrial arts is an expensive item in school budgets. We must justify our goals beyond the efforts of other fields, and we should face honestly the fact that those who are already in Title III may prefer to see industrial arts excluded because we have such an expensive program. We must become super salesmen and sell our program above the ones now in and those trying to get in. In Title III, however, we have wonderful bipartisan support on both the Senate and the House sides of the Hill. When we requested Congress to include industrial arts in Title XI, to my knowledge all of the people, republican and democratic, on the subcommittees in both the Senate and the House, voted for the inclusion of industrial arts except one, and she, creditably, stated she wished to study the matter further. We do have support, but we must not stop now, or we cannot expect to have industrial arts included in Title III. We must continually tell the story of industrial arts, tell our needs, tell what we can do that no other subject area can do. Industrial arts is a unique offering. Let us make this known.

When it was found that Senator Wayne Morse would be unable to speak at our conference because of pressures of business with a Senate Labor subcommittee, I submitted to him three questions, with the expectation that his answers would be helpful to us in planning for the future. Following are the three questions, Senator Morse's answers and some personal comments.

Question: Do you think NDEA will be open this session of Congress:

Senator Morse: Since S 3047 opens Title II of NDEA, it is possible that other titles of the act could be given consideration.

Comments: My opinion is that when NDEA is opened in Congress, industrial arts will be included in Title III. But it seems to be the opinion of the Administration and of the National Education Association, as well as of some congressmen and senators, that NDEA will not be reopened this year. We do know that there have been numerous bills introduced by members of Congress to reopen NDEA, for instance, one by Senator Harrison Williams of New Jersey, who asked us to present floor remarks to help him lay a bill before the Senate. This should occur at any time,

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although it does not mean that NDEA will be open for hearings and discussion.

Question: If open, what are the chances of having industrial arts education included under Title III?

Senator Morse: In my judgment and speaking only for myself, Title XI now includes industrial arts institutes and the Senate subcommittee has tried to maintain a parity between Title III and Title XI. I would believe that in Title III expansion of subject matter areas to include industrial arts would be feasible. However, I emphasize that this point of view is not necessarily shared on both sides of the Hill nor by all of my colleagues. In other words, the factual case for inclusion needs to be made in the House and Senate subcommittees.

Comments: He is saying in effect that we have our work before us yet.

Question: Do you feel that categories may be stricken from NDEA to make it an open act?

Senator Morse: This is a difficult question to answer at this time, since there are many imponderables. In my view, chances for such a step would improve if court cases now in progress clearly establish constitutional guidelines leading to this end.

Comments: I personally believe that the AIAA should support a noncategorical bill if it should be offered. I realize, though, that many industrial arts leaders do not agree with this position.

Now a brief summary of where we stand in Title III. It is up to you, back home, to really do the job. We can talk to senators and representatives, appear before subcommittees and present information, but we cannot vote for your congressmen and senators. They would prefer to hear from you, their constituents, rather than from us. They will listen to you. If you have a good piece of literature on industrial arts, send it to a member of Congress from your state. If there is a need, make it known. If you are an officer of a state or local industrial arts association, try to get resolutions sent to your congressman. Periodically pick up the telephone and call your congressman. Say to him, "Where do we stand now, Mr. Senator, in NDEA Title III?" Let him know you are interested and he will be interested in you.

Now to touch briefly on the opportunities for industrial arts in the Elementary and Secondary Education Act of 1965. Congressman Hugh Carey had this to say on a recent occasion: "Ken, I personally think that industrial arts has more to gain from the Elementary and Secondary Education Act than any other single curriculum area. With your curriculum as it is designed, I believe this bill is a must for you." As you know, Congressman Carey is one of the very strong people on the Hill in the interests of industrial arts. He championed our cause for us on the House side when industrial arts was not even discussed in Title XI, at the time the Senate bill went to the House. He will help us on Title III. The American Industrial Arts Association was one of four curriculum departments invited to testify orally on the Elementary and Secondary Education Act, and of course we did.

Title I is considered to be a poverty bill, but do you realize that 95 percent of the school systems in the nation can qualify? And do you know that all you need to do is take the initiative and present to your local or district representative a proposal for funds for industrial arts under Title I and if you present your case properly you will qualify? An example is the case of one classroom teacher who presented on his own initiative a proposal to his local superintendent which went through channels and obtained $16,000 for a metal technology laboratory in industrial arts for a junior high school. Unfortunately, since industrial arts people never have been involved in federal dollars, we are not taking the proper initiative. We must. It is up to us. Senator Morse said to me, "Ken, I am convinced that your testimony helped get this bill passed." We have worked hard for this much success, let us not falter now.

Title II. How many have wanted textbooks, magazines and other educational materials to help you in your chosen field? The money is here, in Title II. But you must ask for it and justify your need. Here is an example. I made a study of the departments around the NEA to find how many other professional journals were in libraries in school systems. I found that most departments in NEA have no less than 6,000 copies, and some have as high as 22,000 copies of their professional magazine in public school libraries across the nation. So I asked our own secretary, "How many library subscriptions to *The JOURNAL of INDUSTRIAL ARTS EDUCATION* do we have?" And the answer was, we have less than 700. Our people simply will not ask to have this professional magazine in their school library. We helped get the legislation, let us use it. We deserve it.

Title III has been discussed at some length, and many industrial arts projects have received grants. If you need funds for Supplemental Centers and Services we suggest you study Title III.

Title IV extends the cooperative research funds of the USOE by $45 million. Significant is the fact that individuals and associations, as well as colleges and universities can now receive research grants through Title IV.

Title V is the one that strengthens state departments of education. It is very important for the industrial arts field. There are 28 states in the nation that do not have any type of state supervisors of industrial arts. We have hoped to see this figure reduced. Every industrial arts association should be dedicated to the furtherance of this objective, and should ask state superintendents of public instruction to provide a staff for the improvement of instruction in industrial arts, through Title V. The funds are available. We have not received more because we have not asked.

Finally, we have not realized that industrial arts has been just as involved in scholarships and fellowships and opportunity grants as any other subject area because these funds are not categorical. For example, we have had numerous industrial arts people studying under graduate fellowships from NDEA, while some other of our people did not even know that it was applicable to our profession.

My plea is this: Let us discover what is available, make the effort to qualify, and then let us use what is obtained, with planning and foresight, and make industrial arts a great profession. We can become a major curriculum area along with math and science, because technology is just as important as any other phase of our educational family.

We have just written a book on federal aid for industrial arts which we expect will be most helpful and informative. This may be ordered from our national office, and contains detailed information about all phases of our discussion in regard to fellowships, scholarships, opportunity grants, and other help that federal assistance can render. ■

Frontiers in Industrial Arts Education

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When I accepted the invitation to speak to this association, I did so with great misgivings. I am not an authority on industrial arts education nor have I had sufficient experience with the field as an observer to prepare an intelligent critique of present programs—to say nothing of trying to outline better ones. What I shall seek to do is to mention the new problems we all face in American education. Then, I want to suggest some of the new frontiers likely to be reached if leaders of industrial arts education employ their imagination and their knowledge of the field to devise programs that promise to use effectively the resources of industrial arts in developing a more adequate education of our people. . . .

Among the new problems we face in education, five seem to me particularly relevant to the concern of industrial arts education. With the increasing use of technology in agriculture, industry, defense and the health services, the demand for unskilled labor has sharply diminished and is continuing to drop. The last monthly report of the Department of Labor showed less than 6 percent of the labor force as unskilled. Yet in the United States, and in other advanced nations, between 15 per cent and 20 per cent of the population have not acquired sufficient skill and general literacy to qualify for skilled or higher levels of employment. The fact that about 80 per cent of our children have achieved an educational level above the minimum requirements for modern literacy and employment is a tribute to the determination of our people and the efforts of our schools. But this is not enough. As of today, more than 90 per cent of our children must be effectively reached by our educational efforts. We know how to stimulate and guide the learning of children who come from homes where education is valued and where the basis for it has been laid in the home experiences. We do not have widely accepted means for reaching children whose background has given them little or no basis for school work. To reach all or nearly all of these children is a new educational task of our schools.

Can industrial arts contribute to the working out of this problem?

Effective Post-High School Education

A second new task is also partly a result of modern technology. As automation has sharply reduced the demand for unskilled labor, the occupations in which there is increasing demand are those requiring a fairly high level of education. These are in engineering, science, the health services, education, the social services, the recreational fields, accounting, and administration. Hence, to provide employment opportunities for all our people and to keep our economy fully productive requires a much larger proportion of our youth to complete high school and many more than in the past to gain professional, semi-professional or technical competence. To provide these educational opportunities and to ensure effective learning for youth from varied backgrounds of training, experience, and outlook, is another new and important educational task which we now face. Neither we, nor any other country, has previously attempted it.

But we do have some experience to suggest one fruitful way of aiding students at the high-school and post-high-school level to continue their education. For many youths, learning is only meaningful if they can see a direct connection between what they are learning in school and what they aspire to do in jobs outside of school. The so-called "pre-tech" program at the high-school level is designed to prevent school dropouts by motivating students to learn in preparation for a definite occupational goal. This involves certain changes in the high-school curriculum so that reading, mathematics and science can be seen by the student to be more clearly related to his goals.

A similar type of attack was worked out some years ago at the Rochester Institute of Technology. A curriculum was devised to educate youth who came from homes where no one had previously gone beyond high school. These young people thought that college was abstract, irrelevant to the jobs they could get, and beyond their ability to succeed. To devise a program meaningful and attractive to these students, two basic changes were made. The first of these was to reverse the order of the engineering curiculum by dealing with the more concrete processes first and abstract matters, like advanced mathematics, were introduced after the students felt in command of the more concrete material.

The second way in which this program was made meaningful to the students was to pair them off, one member of the pair going to work while the other went to school; the next quarter the roles were reversed. The Institute provided coordinators to aid in planning the work experience so as to relate it to what was being learned in school. The students gained confidence from the fact that they could do a job successfully, and the education they were getting was really related to their work. The Rochester and the "pre-tech" experiences demonstrate that many dropouts and "failures" are not due to lack of ability but to lack of motivation, lack of confidence, poor working habits and the like. Can industrial arts make an important contribution to the problem of getting a much larger proportion of our youth to complete high school and many more than in the past to gain professional, semi-professional or technical competence?

Re-education of Adults

Technological change is producing a third new task, the re-education of those whose jobs have been eliminated by automation or have been greatly changed by the development of new techniques, materials, or devices. Until very recently, technological change moved slowly enough so that the members of each new generation took new jobs and acquired the new knowledge and skills but the members of the older generation were able to stay in the old jobs until their work careers were ended. Thus, although the coal miner's children are not in the mines, most of the coal miners of the 20's finished out their working years without moving into a new occupation. This is no longer possible in most fields. Many people now are, and will be, changing occupations during their working career, and many of these changes require education and training to obtain the necessary understanding and skills for the new jobs. This is another educational task for which we have meager experience and no tested doctrine to guide us. This may seem to be a highly specialized task unrelated to industrial arts, but is it?

Because these three tasks—educating the children who have not heretofore been reached, affording effective post-high-school education for many youth with limited educational backgrounds, and providing for the re-education of adults—have come to attention as a result of occupational changes, we are in danger of thinking of these tasks as devoted solely to occupational education. This would be a mistake. The requirements for effective functioning as citizen, neighbor, and family member also demand more adequate education. Even the use by the individual of the many avenues for his self-realization can be greatly enhanced by learning. Without spelling this out in detail, it is obvious that the political, economic and social problems we confront today are not adequately understood by the citizen whose education is limited either by amount or by concentration on occupational preparation. Hence, these new tasks must include the elements of a comprehensive educational program. Clearly, this offers important opportunities for new developments in industrial arts.

Career of Continued Learning

Finally, mention should be made of a fourth new task faced by our schools and colleges, the attainment of certain new ends or objectives. One of these is to teach students how to learn. With the rapid acquisition of new knowledge, it is no longer possible to give the student in school an adequate command of the facts in each major subject which will serve him throughout the balance of his life. The school can only start him on a life-long career of continued learning. Hence, an important aim today is to teach students to learn and to develop in them a strong interest in continued study together with the skills required to keep on with their learning after graduation. This objective has not generally been accepted by schools and colleges in the past, although some teachers here and there have given it major attention. Teaching students how to learn is commonly viewed too narrowly. Many people think only of reading, the use of libraries and other printed sources as ways of learning. These are useful methods, of course, but they are incomplete. Observation, reflection, exploration with materials, experimentation are also among the important ways to learn. How can industrial arts contribute?

Life Planning

Another new objective is to help each student develop the interests and abilities required for continuing life-planning, that is, career planning, planning for constructive civic participation, planning for satisfactory recreational activities, and the like. Studies of modern communities indicate the lack of continuing development on the part of most of us. Career choices and most of the other major choices in life are not made once and for all but they represent an ongoing process. To gain most from life, tentative plans and periodic revision of plans are necessary. Can industrial arts help in the more adequate attainment of this objective?

Aesthetic Standards

Other objectives are being given new emphasis because of the increasing availability of a wider range of products combined with a decreasing experience of the consumer in their manufacture. The development of aesthetic standards for the selection and enjoyment of products is one of the aims now given greater stress and another is the development on the part of the student of a genuine appreciation for good craftsmanship, both on his own part and on the part of others. Surely these objectives are of central importance in the industrial arts.

A fifth problem faced by modern schools is to build a more adequate bridge between the world of sense experience and the effective use of thought to understand and to extend the direct experiences we have of the world through our senses. Our great scholars have reminded us that the mind serves to organize and to interpret what we experience directly. Words and thoughts unrelated to an experienced reality are phantom images, undisciplined dreams. Direct sense experience that is not reflected upon, explored in imagination, tested by comparison with other experiences, has little meaning. Education is responsible to keep these developing in relation to each other. Yet, too often, the child finds reality in the home, community and playground but does not see the reality with which the classroom deals. Too often the discourse in the classroom seems meaningless because it has little to do with reality he has experienced. But we are also often guilty of having students making things in shop and studio without their understanding what they are doing. What can industrial arts contribute to this serious problem?

We Must Innovate

These five problems are not all the ones we are called upon to solve in order for our schools to meet the demands now being made but they are among the most important ones. They cannot be solved by doing exactly as we have been doing in the past. New frontiers require new roads. We are called upon to innovate. The innovations required are not limited to minor adjustments in teaching procedures. In some cases, we need to devise new institutions and new institutional arrangements. For example, in attacking the problem of helping children from limited home backgrounds, several new forms of learning centers are now in operation. Some are extensions of the public schools, some are laboratory centers under the direction of university departments, some are cooperative agencies of community or neighborhood groups, some are projects of churches, some are new, non-profit corporations, and there are several other forms of institutions. Not all of these are likely to be successful, but the encouragement of innovations in institutions and institutional arrangements increases the likelihood of getting more varied ideas tried, of involving a wider range of people who might contribute to the program and of escaping some of the restrictions which commonly develop in older institutions because of the rigidity of traditional attitudes and practices. The new Elementary and Secondary Education Act authorizes federal assistance in the support of supplementary education centers and this should make a constructive contribution to developing new and needed institutional arrangements.

Innovations in curricula and educational programs should also be encouraged. During the past six years, many new ideas and materials have been emerging in most of the academic fields at the high-school level. New courses are being constructed and tried out in mathematics, science, foreign languages, English, and some of the social sciences. We should extend these innovative efforts to other fields and more adequately to the college and to the elementary school.

Innovations in the way in which student learning is stimulated, guided, encouraged and evaluated, are also greatly needed. The age-old traditions of the teacher-student relationship, the rigid methodology of lecture, recitation, laboratory work and the term paper, and the narrow conception of human learning as specific conditioning need to be modified or superseded by many vigorous efforts to devise a wider range of means of getting effective student learning.

A fourth area for innovative attention is in working out effective ways for utilizing a greater variety of people in the educational process. The effectiveness and efficiency of our health services have been greatly improved by the development of procedures by which doctors, nurses, practical nurses, technicians, social workers, clerks and volunteers can contribute constructively to the healing process, using the special competence each has developed. To a limited extent, educational innovations in this area are under way through the exploration of team teaching, the use of part-time service in correcting English papers, the tutorial work done by college students with children from slum areas, and the adult education discussion groups conducted by trained volunteer leaders. However, the possibilities here have barely been touched in spite of the growing demands for education and the increasing number of educated adults who are genuinely interested in part-time service.

A fifth area in which innovations are emerging is in the use of modern technology for educational purposes. This quickly brings to mind educational television, motion pictures, tape recordings, teaching machines, programed materials, and computer-assisted instruction. There is high current interest in these developments. At the present time, however, the yield from the innovative efforts has been small. Too many of the projects undertaken have been guided by those whose training and competence are in the technology and they have not been wholly familiar with the educational tasks, the aims sought, the conditions of learning to be maintained, and the like. However, today some experiments have been started by persons who have the educational competence as well as having knowledge of the technology being used. We need many more efforts of this sort, in order to gain the possible values of technology for the benefit of education.

Recent legislation furnishes a very important aid to educational innovation. In 1963, the United States Office of Education was given authority and initial funds to support centers for educational research and development. A center brings together research people and educational practitioners to attack a problem area like that of educating children from limited backgrounds or that of providing for individualized educational needs. Research is conducted on these problems to obtain better understanding of them and the knowledge thus gained is translated into teaching procedures and instructional materials which are then made available to the schools.

This year, the new Elementary and Secondary Education Art authorizes support of regional laboratories to bring together resources from schools and colleges to aid the schools in the region to develop and to use innovations which offer promise of greater educational effectiveness and efficiency. Support for these laboratories will provide a significant stimulus to innovation based upon study, experimentation and demonstration.

But these research and development centers and regional laboratories cannot do the total task of getting into actual operation the innovations we greatly need. In addition, each of us—teacher, administrator, board member, legislator, and lay citizen—has a responsible part to play. Innovations require constructive ideas, the testing of these ideas in practice and the application of tested ideas in the schools and colleges. These steps involve us all, not simply the research people and the professional educators.

Teachers and administrators are in a position to see the need for improvements and to suggest better ways. Board members and legislators are in direct touch with some of the different educational problems and can often suggest possibilities for exploration. Although the lay citizen is not directly involved in the operation of educational institutions, his experience as student, parent, employer, or in other areas of society frequently yields suggestions for innovations in institutions, programs, procedures, and the better use of people who are interested in education. Were all of us to devote some of our time and thought to educational innovations, we could greatly extend the supply of promising ideas worthy of trial.

We also have a responsibility for active participation in the new educational efforts. Teachers and administrators are needed who are willing to innovate in their own work and will engage enthusiastically in new and promising enterprises. School board members and legislators need to inform themselves sufficiently to understand what these innovations are, how they are progressing, and what they require to carry them to the point where their success or failure has been demonstrated. Lay citizens have responsibility not only for keeping informed about the progress of innovative endeavors but they are needed to participate as volunteers in some of the projects that are undertaken.

Each of us also plays an important part in establishing the essential conditions for continuing effective innovation. The psychological climate can strongly influence new enterprises, either by encouraging or discouraging them. Too often, the prevailing attitude is that what has been done is right and new things are suspect. This attitude is changing in education as it has been changing in agriculture, industry, and medicine, but most teachers and administrators still feel that as long as they continue in the old ways they will encounter no criticism, whereas if the new projects are undertaken, they will be in for attacks which divert their efforts and tire their energies. All of us can help to develop a climate of opinion which expects innovation and is critical of practices which are not periodically appraised in appropriate terms.

Correspondingly, innovations require support—not only moral support but also financial assistance. If new ideas are to be developed fully, tried out, and appraised, the necessary resources must be found to make these steps possible. Teachers, administrators, board members, legislators, and lay citizens can aid in allocating resources for innovation, and in contributing to or voting for their support.

Finally, we all have a role in rewarding constructive innovative efforts. Teachers, administrators, and board members must see that promotional and salary policies include work of this sort among the basic criteria for promotion and for salary increases. The public generally, through the way in which honors are bestowed and persons are given recognition for accomplishments, plays an important part in rewarding or failing to reward those who innovate.

Schools and colleges today are faced with tasks which cannot be accomplished without extensive innovation. All of us are responsible for developing the necessary innovations so that our hopes and aspirations for education can be realized. New frontiers in education can be reached if we can accomplish the new tasks we face and can work out the innovations required. This is a great opportunity for industrial arts education. ■

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Industrial Arts Education: The Four Riddles

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Once—long ago, so the legends say—a young man named Oedipus set out to rid the ancient city of Thebes of a curse which had been sent against her by the gods themselves. Through the forests and the plains which bordered the great walls of the city there roamed a fierce, remorseless monster called the Sphinx, which preyed upon the unwary traveller. As quizzical as it was carnivorous, the creature posed a single, invariable riddle to its victims, and immediately devoured them when their answers proved unsatisfactory.

Of Oedipus, when that youth had sought out the monster, it asked its famous question: "What is it which walks on four legs in the morning, two legs at noon, and three in the evening?"

But this time the answer was instantly forthcoming. "Man," declared Oedipus, "who crawls on all fours in infancy, walks upright in the prime of life, and totters with the aid of a cane as he approaches the twilight of existence."

The Sphinx, lashing its tail, cast itself from the cliff on which it crouched, and Oedipus was free to proceed to Thebes, which hailed him as a hero. It is not recorded that he ever had to solve any more riddles, or answer any further questions.

Would that education were that lucky! If only we who are in this supremely puzzling profession could purchase the freedom of our own walled city from the malignant enemies who prowl about it increasingly these days, merely by coming up with the answer to a single question!

But unlike Oedipus, education is confronted not with one question, but with many. The vital segment of education known as industrial arts faces not only the questions which confront the entire profession, but also certain highly specialized riddles of its own. Of an almost infinite variety, I have chosen four with which to puzzle you today.

No. 1: How do We Keep the Shop Class from Becoming the School Dump?

The following scene is rehearsed a thousand times a day throughout the land, with minor variations in dialogue hinging upon geographical diversities and administrative personalities.

Mr. Smith, the boys' vice-principal, is passing the buck with a sigh of relief to Mr. Jones, the high school principal.

"We're simply going to have to do something about Eddie Brown. He got kicked out of geometry last week for misbehavior, and today Miss Guggenslocker told me she simply would not have him in her English class any longer. In fact, she said she'd be in to see you if I sent Eddie back to her. And you know Miss Guggenslocker."

Jones winces visibly. He still bears the mental scars of Miss Guggenslocker's last visit.

"Obviously Eddie isn't academically inclined," he muses. "Why not try him in shop?"

The vice-principal shrugs. The industrial arts teacher is a man, and a big, strong one at that. He's used to dealing with boys, and his class is one where the kids can move around and talk quite a bit. Smith's conscience troubles him a bit, however. He's been sending more and more problem cases to Mr. Johnson, the industrial arts instructor. It really doesn't seem quite fair.

"Oh, well," he rationalizes as he sends Eddie off to his new class with a pink enrollment slip, "if a boy is too stupid or too badly behaved for college preparatory classes, shop is the only place for him. He'll be better off working with his hands."

Baloney.

There's no evidence that Eddie wants to work with his hands either. All the school has done is take one more step toward turning its industrial arts department into a dumping ground for mental misfits and semi-slobs. And this is **not** the purpose of industrial arts education.

Prior to World War II, industry and labor used to work closely with the schools in providing pre-apprentice training in the high schools. "Shop" courses had real meaning then for the boys who enrolled in them. They led directly to journeymen's cards and eventual jobs.

The industrial arts instructor was respected and admired. Highly educated and specially trained, as indeed he is today, he held in a very real sense the keys to the future for the youngsters with whom he worked. He had able pupils in his classes, and morale was high, because there was something definite and important to look forward to.

Following the war, and in too many states, industry and labor tended more and more to withdraw from this cooperative program. Industrial arts courses tended increasingly to operate in an enforced vacuum, divorced from their former highly practical contact with the workaday world. Boys could see little reason to excel in their work; after all, they would just have to do it all over again when they got out of school and into regular apprentice training. Too many industrial arts classes came to be "busy work." Too many of them too began to be places where boys were sent who couldn't get along anywhere else.

I repeat: this is *not* the purpose of industrial arts education.

Its purpose is to prepare young people to lead successful lives as highly skilled and well educated workers, assets to the nation and worthy successors to the magnificent "blue collar" workers who built out of a primeval wilderness this machine civilization of ours which is currently the wonder and the envy of the whole world.

More and more schools are recognizing the vital significance of industrial arts. The solution to the currently agonizing high school dropout problem hinges largely upon the way we educators face up to the need to restore dignity and meaning to this highly specialized and complex field of learning. But before we can do this, we are going to have to come to grips with

No. 2: When Is a Subject Academic?

California has recently been struggling in the sticky flypaper of the question: "What is an academic subject?" I suspect that most of you here today either are currently faced by this purely synthetic issue, or soon will be in your own states.

Our legislature a few years ago set up a double standard for new teachers. Those intending to teach in the Elysian Fields of Academe can get a credential sooner and with fewer units of preparation than their less rarefied and more earthy colleagues who are planning to spend their professional lives in the so-called nonacademic areas of the school curriculum.

This brings up the question which is the subject of Riddle No. 2. Lots of people smile and say: "Why, everyone knows what an academic subject is. It's something like Latin or trigonometry or English literature."

Very well, Let's concede that it's usually relatively easy to spot a subject which happens to be academic. The trick comes in identifying those which aren't. And it's a considerable trick, believe me. I doubt if anyone here can tell me what a nonacademic subject is. I know our state legislature can't. Neither can our state board of education. I certainly can't. For example:

I happened to be present when our California Board of Education was wrestling with the problem of how to classify public speaking. It was a pretty important question for the university and state college professors of speech, for obvious reasons. These worthy gentlemen, not having been behind the door when the brains were passed out, had their most eloquent and Ciceronian members on hand at the meeting to persuade the board that public speaking was indeed as impeccably academic as Attic Greek.

Have you ever heard a bunch of public speaking professors arguing for their professional lives? What a show they put on! It was fantastic. Pear-shaped nouns hung and glowed in the electric atmosphere. Verbs fresh from the Vulcan's forge of oratory thundered around us, reverberating from wall to wall, leaving a crackle of ozone behind them. Demosthenes and Daniel Webster might have lent a little added class to the demonstration, but in point of fact could have added but little to the Niagara of declamation which cascaded upon the stunned and shaken board members.

Finally one of them could stand it no longer. He leaped to his feet, for all the world like the Reverend Arthur Dimmesdale in the next-to-the-last chapter of Hawthorne's *Scarlet Letter,* figuratively bared his bosom, and publicly confessed that he, too, had been a speech major in college. In a twinkling it was all over. Resistance ceased, and everyone joined in a perfect orgy of agreement that public speaking, under the alias of rhetoric, was at least as old as Plato and Aristotle. Some even traced it back proudly to Pythagoras.

With a collective and audible sigh of relief, the board adjourned. As I walked out the door, one little fellow with a wisp of hair round his bald head, thick horn-rimmed glasses, and a receding chin came up to me and plucked me nervoulsy by the sleeve.

"I didn't want to say anything under the circumstances," he murmured deffidently. "After such a display of verbal pyrotechnics, I wouldnt' have come off very well. But I happen to represent the agriculture teachers, and we do think we have a point, though we may not be able to get it across as well as these fellows."

"Agriculture wants to be declared academic too?" I asked.

He nodded emphatically.

"And with all respect to those Greeks the speech boys kept dragging in just now, we submit that our subject goes clear back to Cain and Abel."

There's little I can add to that. It sums up the whole ridiculous problem pretty well. Just about any school subject can lay claim to being academic. Especially yours.

The real question we should be insisting that people ask is, "Who cares?"

What's needed in our profession is the sharp upgrading of the importance and dignity of subject matter after more than a generation of the downgrading of all subject matter by an educational philosophy which held that subject matter was the least important thing the schools exist to teach.

Whether it's art or auto mechanics, history or home economics, mathematics or music—if a subject is in the curriculum of a given school, placed there by the elected policy-making representatives of the voters, both it and its teacher are just as important as any other subject or teacher. If it's not worth this kind of treatment, get rid of it. Turf it out of the curriculum altogether. But don't let anyone set up first-class and second-class teachers in our schools. Or subjects.

In case you're wondering how we solved this problem in California, I'll tell you. Incidentally, only California could have solved it this way. Recently our state board decided unanimously that any subject would be declared academic in the future if it were just taught academically. That took care of everything.

If we really want public support for our struggle for equal status, though, we're going to have to pay attention to

Riddle No. 3: Why haven't we done more to improve pupil attitudes?

Never in any nation's history has there been such a hue and cry after vocational education and industrial education as the one in which we are currently engaged. The Youth Corps and the Job Corps are nosing every likely copse and thicket, quivering with eagerness at even the slightest hint of short-cut methodology stirring within, and pointing rigidly whenever a bashful new technique whirrs unexpectedly from covert. The beaters and gunbearers of the Economic Opportunities Act are flushing the countryside in all directions, seeking not only the elusive quarry of trainable and willing unemployees but also the game bags labeled "job rehabilitation" in which to bear the spoils of the chase triumphantly back to the nearest vocational training center.

The whole power of Uncle Sam has been unleashed to get into the hands of unskilled labor the tools and the skills needed to transform it into skilled labor. We are told on every side that the aircraft industry is crying for all sorts of strange and esoteric mechanical abilities, and that the schools are going to have to install everything from micromillimetric measuring devices to nuclear reactors in order to train the highly specialized technicians needed to service both the Air Age of today and the Space Age of tomorrow. The same claims are made for an increasing segment of both heavy and light industry.

There's no doubt that this is true. We're going to need better trained experts in many industrial fields, and it's perfectly true that this means more complex and expensive vocational courses in the schools.

But important as this is, it isn't the real problem.

For every exotic job opportunity involving knowledge of slide rules and electronic transistors, there are fifty vacancies which involve nothing of the sort.

Want to know the kind of qualifications these jobs require? Here they are:

(1) Ability to read without lip-moving, and without a glazing of the eyeballs whenever a word of more than two syllables comes along.

(2) Proficiency in making change, which in turn requires certain minimum essentials in adding and subtracting.

(3) Moderately acceptable vocal speech patterns: that is, conducting a conversation with relatively few gross grammatical errors and with absolutely no reliance upon such ineffable verbal crutches as "Crazy, man!"

(4) Willingness to shut up, take orders, and work hard.

(5) Cheerfulness, helpfulness, and a civil tongue in one's head.

I submit that all five of these qualifications are in uncommonly short supply these days. I submit further that the schools are in an excellent posture to supply all five. And I'm willing to bet that in the vast majority of jobs available today and tomorrow, the applicant who has mastered all five is not only going to get hired; he's going to stay hired.

The proprietor of a combination garage and gas station cornered me the other day after a meeting, and prodded me on the chest with a meaty and slightly discolored forefinger.

"I hire a lot of kids just out of high school," he began, breathing heavily. "And I have to let a lot of them go pretty quick. Not because they don't know how to operate the equipment. Heck, I can teach them that in a day or two. Oh, no. It's because they don't know how to *work*. They lean on a broom or a grease gun for five minutes, and they want a coffee break. Leave them unsupervised for ten minutes, and they're over at 'Tiger a Go-Go.' Dock 'em when they come in late, and they think you're Simon Legree."

He eyed me despairingly.

"Why don't you school fellows forget the lathe operation and the band saw rigging and all that, at least until you've taught these kids the right *attitudes*? If they've got that, we can give 'em the rest they need, right on the job."

I told him I'd do my best. As he walked away, he looked back over his shoulder.

"And while you're at it, try to talk them into shaving, getting a hair cut and throwing away the open-toed sandals. I've got no objection to some character going around looking like Peter the hermit, but I'm hanged if he's going to work in my place."

Okay, my colleagues in industrial arts. You heard what the man said. And you know something? I think he's right.

And this brings us finally and inevitably to the great question which faces us all, not as industrial arts teachers or supervisors or administrators, but as educators, engaged in the mightiest and most wonderful art mankind has ever known—the art of teaching.

Riddle No. 4: What is the ultimate purpose of education?

All the other riddles have to take a back seat to this one. Indeed, there will be no final solution of any of the others until we have reached a consensus on what education really is.

It's not just teaching the fundamentals, nor indoctrination in patriotism, nor learning to read via the phonics method, nor any of the multitudinous things which the public tends to confuse with education just because they happen to be controversial and hence newsworthy.

No, the real nature of education is harder to come by than through an inquiry into one or many of these things. The problem will be susceptible to solution only when we Americans decide whether education has indeed a great and shining purpose—whether it is to be used as a mighty, disciplined weapon in the war against ignorance and stupidity—or whether it is to be cramped and crimped and cabined into a narrow frame of reference which compels it forever to adopt an attitude of sterile neutralism toward the great issues with which education was first called forth upon this continent to deal.

Californians, for good or ill, have hitched their wagon to the new philosophy called "education in depth," summoned into being by the watershed election of 1962, and created specifically to replace the old, outworn, exploded dogma of pragmatic, permissive "progressive education," which held sway in our state for so long and which did such tremendous harm to a whole generation of our young people.

Education in depth holds, among other things, that in this world, this life, this universe, there *is* such a thing as *truth,* and that education exists to seek after that truth, no matter where it may be or how deeply it may lie hidden. In order to do this, young America must learn to use the tools which the race, over the centuries, has found to be indispensable to the conduct of this quest. The ultimate truth indeed may never be found by mortal, erring man, but its very pursuit cannot but ennoble those who take part in it. Is there any greater goal in all of life than this? Is there a worthier cause under the sun for which we can arm and inspire our children?

"What is truth?" asked jesting Pilate, and would not wait for an answer. Let us wait—and persuade the children to wait—at least long enough for the tools to be provided so that they will be equipped to recognize truth when they see it.

This sounds, I suppose, like a platitude, but it is far indeed from being platitudinous. Upon the final resolution of this question hang all the keys to the future. For by saying that the real purpose of education is to pursue the truth, we are saying that there is in fact a truth to be pursued, and here is where the great storm currently raging in our profession finds its epicenter. This is what the long-range fight in our calling is actually about. This is what the real enemies of education refuse point-blank to concede.

There are no eternal truths, they say—no lasting values, no positive standards of excellence or conduct. Everything in life is relative. What's good in one time and place may be bad in another. There should be no talk of Good and Evil in the schools, for the very words are meaningless to these people—meaningless as other words like Sin and Virtue, Honor and Dishonor, Treason and Patriotism.

You've read in your newspapers, you've seen on your television screens what these enemies of education believe. They go up and down the land tirelessly, even as we meet together today, preaching the gospel of destruction. . . . The only thing worth learning is the thing that "pays off"—right now—the thing that "works."

There are no wicked people, only a few suffering from psychological maladjustments. So anyone should be allowed to teach school, regardless of criminal records, homosexual attitudes, or communist affiliations.

There are no dirty books, just "avant garde" literature. So everything that's printed should be supplied at the taxpayer's expense to the taxpayer's children in school, and if nothing sufficiently vile can be found on the market, the teacher himself should be encouraged to write pornographic plays to be produced by the pupils.

"Freedom" and "liberty" and "grassroots government" are just old-fashioned, high-button-shoe slogans, so an all-powerful state or federal bureaucracy should take over the schools, and local control of education should be abolished.

Well, I'm sorry.

I just can't go along with this cynical, sick, profoundly alien philosophy. I believe with all my heart that had our ancestors adopted a point of view like this one, none of us would be here today, and that this nation, instead of being, as it is, the wonder and the envy of the world, would be merely the latest in a long, heart-breaking line of tyrannies, built upon brute force and dedicated to crass materialsim, of which this planet has seen so many.

I believe instead, and I think I have pretty good evidence that our people believe too, that the schools exist to bear witness to the Good, the

Beautiful, the True, and to inculcate these immortal verities into the minds and hearts of the generation now growing up all around us.

If this is old-fashioned and quaint and sentimental, so be it. The schools of America have performed this mighty function for more than 300 years. Founded upon the rock of principle, they have taught decency and morality—yes, and love of country—to ten generations of Americans, and they have done it well, despite what the sneerers and the scoffers would now have you believe.

In the light of the colossal threat now facing us on every continent, under every sea, and out into the vast void of interplanetary space itself, surely education has not only the moral obligation but also the positive charge laid upon her to affirm the lasting values which have made this nation unique of all God's handiwork, and to make as sure as mortal, fallible man can ever be that these precious, irreplaceable things are not lost irrevocably through disuse and contempt.

For education in this year 1966, nothing more is really necessary. But nothing less will do.

These, then are your Four Riddles—yours and mine. All of you, I'm sure, can think of many more. But these four strike at the very roots of the professional dilemma in which we who are friends of industrial arts education find ourselves today. The dilemma, briefly and brutally, is that our profession is fragmenting both internally and in the eyes of those who support and populate the schools. The problem we may indeed solve, but it serves merely as the curtain-raiser for the enigma which challenges the entire profession of which we are all a part! That as a profession we have diverged increasingly from the mainstream of American public opinion during the past thirty years.

If we teachers will but remember that the children belong not to us, but to their parents—if we will remember that education exists not only to enable each child to realize his maximum potential but also to ensure the survival of the United States of America in the second half of the twentieth century—and if we will remember finally that we are the proud practitioners of the most ancient and marvelous art in all the history of the human race, the art of teaching—then in very truth will bridges spring up to span the rift which has separated us for so long from the sources of our true strength—and we will go forward hand in hand with the children who have been given into our charge for good or ill, into the broad, sunny uplands of a future in which all riddles will find their answers, and every Sphinx her Oedipus.

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Problem Solving Approach to Industrial Arts Drafting

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When speaking of teaching the creative student, people speak in terms of English, advanced courses in math, accelerated sciences, languages. They stress the so-called academic courses. In order to develop originality, they steer students into creative writing. But how often do you see an English teacher put a fatherly arm around a small girl with a high IQ and tell her, "A great student like you should be taking industrial drawing?" Unfortunately, this does not happen in many schools, and I say unfortunately because a student like her *should* be taking industrial drawing.

Let us raise the horizons of industrial arts and offer courses with creative projects to appeal to students with creative interests. Should not the gifted boy who does not want to dissect frogs be given a chance to develop a computer if he is so inclined? In one of my classes I had a 13-year-old boy who wants to become a doctor. He invented a heart-lung machine that was small, economical, and feasible, a project that furthered his knowledge in many areas, medicine and physiology included. It was industrial arts that enabled him to design this machine. In the same class, another 13-year-old boy explored Einstein's Theory of the Fourth Dimension (height, width, and depth are surely associated with industrial drawing, plus the fourth dimension, time), another project made available through industrial arts.

Einstein's Theory of the Fourth Dimension is also an excellent topic for another type of activity, a brainstorming session. The students are asked to explain the theory, using descriptive geometry and reference planes. A brainstorming session may begin by having one student illustrate his explanation on the blackboard. It is important to keep the students involved and challenging one another. If the session is successful, discussion may continue not only through the period, but during lunch and after school. After the initial brainstorming activity, students are asked to write about the question, and in the case of Einstein's Theory, make drawings of their explanations using descriptive geometry. When this problem is used at Portola, the students are given one week to work on the drawings and type up their reports. The concrete answer is not the goal. The important concern is to have the students think on their own, and thus develop the ability to think creatively.

Another method of producing problem-solving ability is teaching descriptive geometry at an early age. Descriptive geometry is offered for eight to nine weeks, giving students an over-all view and working knowledge of the subject. Lecture and discussion material is presented in a number of ways to give all students a better chance to understand. The blackboard, overhead projector, opaque projector, and various projection glassbox aids are among devices used. The material is presented through worksheets. A timed performance quiz is given at the end of each unit. The final examination results indicate that this type of problem-solving can be learned easier at an early age, possibly because young minds are not cluttered with preconceived notions and have the ability to grasp new concepts more quickly. Another possible explanation is that students at the junior high age can develop tremendous enthusiasm for anything new. If this enthusiasm were to be encouraged and channeled in the right direction, the junior high years could be one of the most enlightening periods in the student's life.

Through the study of industrial materials, students learn about the properties of materials from an engineering viewpoint. Thus, the primary emphasis is on these properties and on experiments involving these properties so that when encountering a problem involving strength, plasticity, or cohesion, the student can come up with a realistic solution; another problem-solving activity.

In industrial arts, allowing for individual differences is difficult, but essential. All students are expected to be kept busy even though their speed and accomplishments vary greatly. Often there is not time for the slower pupil to finish work outside of class, since many junior high schools, including Portola, identify industrial arts courses as no-homework subjects. (Nor is outside work possible without the required tools.) Also, there must be something provided for the faster student so that his learning may continue uninterrupted. The key to individual differences is not the quantity of material covered, but the depth and challenge of subject matter. Every student should get to do electronics drawing, architecture, or pictorial drawing, but in varying depths. One method of achieving this is to group drawings in units so that they get progressively more difficult, involving more problem-solving and more complex drawing techniques. Worksheets are used to assist in covering a large amount of material in a short period of time. The worksheet has much of the routine work already completed; it leaves only that necessary for the student to learn the principles involved. Students perform such traditional tasks as laying out title blocks and border lines, but only to gain experience and skill, not to waste time or indulge in busy work. Worksheets are also an aid in providing for individual differences.

Part of each semester is spent working on individual projects of the student's choosing. While working on these projects, the students are encouraged to seek advice from resource people in the field. One way of accomplishing this is to organize special field trips involving only a few students. For instance, students designing a highway or a bridge are sent to the California Department of Highways. To gather background material and advice on a satellite problem, students spend a day at Space Technology Laboratories in Redondo Beach, California. STL deals primarily with satellite design. This is not the traditional field trip in which a group of students is taken from department to department and, while looking on, are told what each department does. At STL, special problems such as propulsion, orbital trajectory, telemetry, and electronics are discussed with the department engineers. This phase of the program brings the students into direct contact with industry. The result is first-hand knowledge for the student, a contribution to education by industry, and mutual respect and recognition between industry and industrial arts. Industry has a responsibility to aid education and in the future we must work hand in hand.

One of the most enthusastically received group projects we have offered is designing a city of the future. We started out this semester with a contour map set up to contain many variations in land configuration. A contour model (4′ by 6′) was built including bodies of water. Every student in every drawing class has a part in the design of the city. The large projects from the advanced classes, whether they be architecture, highways, or electrical power systems, are designed with the city in mind. Even the 7th graders, who design beach houses as part of their course, buy lots along the beach front (every lot has a price and a deed), and are required to make the architecture fit in with the general appearance of the city. A planning commission was appointed whose first job was to designate areas for residences, industry, business, and recreation. Students were appointed who will have final approval on such things as health, safety, and aesthetics. A mayor was elected after a campaign climaxed by speeches given to all drawing classes. The class that is mainly in charge of the project made a field trip to the architectural firm Victor Gruen, where they became quite inspired about the aesthetics of a city, the evils of changing the natural contours of land, and the problems of rapid transportation. After weighing the views of Victor Gruen, two architects, and two Los Angeles city planners who were guest speakers, the students decided to design the city so that the need for automobiles will be diminished by elaborate underground rapid transit systems. Highways and buildings will be designed together to assure articulation. The city will be arranged to separate people, automobiles, and trucks, a principle long used in shopping centers. By keeping the city center free from traffic and employing underground utilities and delivery passages, valuable land is saved, congestion and traffic hazards are eliminated, and the city is vastly improved in appearance. Several students are developing air cars, and although air cars do have the major advantage of the automobile—mobility—they also have most of the disadvantages of the automobile and probably will not be widely used. One of the benefits of such a group project is that students learn to cooperate with each other, although the heated arguments that develop would indicate otherwise. Students with similar projects consult each other. For instance, one boy is planning the public utilities—waterworks, power, home teletype network—and another boy is designing a computer to be the central brain for the city. The computer will regulate communications, street lights, automated highways and freeways, public utilities, and civil defense. Since these projects are related, the boys consult each other to assure the synchronization of their projects, even though the boys are in different classes. At the end of the semester, a master plan of the city will be assembled. It will include the planning commission's report, the completed model, drawings of the zoning boundaries indicating all lots, and drawings of the over-all planning, showing the parks, industrial areas, and self-contained villages clustered around the city center where major city features such as the music center will be located.

A unit on city planning is an ideal project for advanced drawing classes containing students of varying abilities. It offers a challenge not only for lower-ability students, but also for the gifted students. When designing a course for the gifted, too many industrial arts teachers unfortunately feel that they must utilize science projects. Science projects are well and good in the science department, but this is not teaching industrial arts. Industrial arts has an untapped wealth of areas which are ideally suited to challenge the gifted. In science, one may study about satellites, or do experiments about satellites, but only in industrial arts can one design a satellite. Industrial arts teachers should not feel resigned to teaching below-average pupils how to read a scale. More satellites should be designed, and air cars, computers, bridges, rapid transit systems, space stations, and airports. Offering stimulating, timely, and just plain challenging subject matter attracts the high-caliber student. A proficiency in English, math, and science becomes *prerequisite* to industrial arts, as is already the case in industry. Industrial arts should stand on its own two feet. If we are to raise the caliber of our students, we must raise our horizons. ■

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Industry's Cooperation with Education

CHARLES F. HORNE

President, General Dynamics

Pomona, Galifornia

The National Education Association is a mighty fine and necessary organization. I always think of it as the "NNEA"—"the Necessary National Education Association." I feel very strongly that your AIAA is a most important department of NEA.

I want to talk to you today about some of the aspects of understanding, strengthening, and improving the cooperation which I deem most necessary for the good of our country and our children, the cooperation and understanding between industry and education, and between education and industry. It has to be a two-way street; using this kind of cooperation of which there has been all to little, all too unorganized in the past—you can achieve a great many more of your goals than if we continue, as has been too often the case, each hardly even knowing that the other exists. That's a strong statement and perhaps you don't agree; but there has not been nearly enough understanding and communication between business and industry and, particulary, the teachers and administrators of industrial arts. That's very hard to understand because if there's anything that industrialists and businessmen ought to be interested in, it's your efforts in industrial arts. And vice versa, if there's anything you folks are interested in, it's knowing a little more and having a little better coordination with just what you are supposed to know all about, industry and business.

Our friend John Gardner has written that practically everyone is interested in working hard to educate and train the specialist and the professional, but all too few appear to be educating people to be leaders. Now, I admire John Gardner, and I think he has a really good point.

Industrial arts teachers and administrators need to be leaders, in my book, just as much as and maybe more than corporation presidents, vice presidents and executives need to be leaders. We need to train ourselves, since nobody else is training us—we have to train ourselves to be leaders.

I can't tell you how important it is for industrial arts teachers and administrators to be leaders. It's generally conceded by most people that business executives need to be leaders, *ought* to be leaders; but how many people really appreciate the importance of leadership—personal leadership—in industrial arts teachers and administrators? I suggest to you that it's a very good idea, and something that together we can do more about. Industrial arts teachers are extremely important. They ought to be a more important and better-recognized part of our educational system. As Dr. Max Rafferty said at this convention you people present to the young people enrolled in industrial arts a survey of the many activities taking place in business and industry and some understanding of the principles of business and industry. I don't think anybody expects that when a youth completes some courses in industrial arts he will be master of anything in particular; but if he has been fortunate enough to have you, an industrial arts teacher who is up to date on some of the requirements and aspects of industry and who is also a motivated teacher, then the student has the priceless broad view, the whetted appetite, the desire to understand and build some skills, and then to use them after they are built. Of course, the next step might be vocational-technical higher education, or whatever, but this role of motivator that you have is one of industrial arts teacher's great opportunities and a great responsibility, a great challenge.

We all agree from our experience, that unmotivated, uninterested students who do not recognize or do not use their abilities, accomplish very little, and there is also plenty of evidence that achievement in life is not necessarily a function of IQ. There's been all too much nonsense about high IQs for this and high IQs for that, and I have plenty of evidence in business and industry, in the armed services, and in education, that the highly motivated, courageous person accomplishes a great deal more than the high IQ who is unmotivated or who is motivated in questionable directions.

It's my hope that perhaps even the very time we are spending together here can help to generate some new opportunities for industry-education cooperation. You members of AIAA can help to provide some new channels—new channels through which folks in industry can deal cooperatively and constructively with our common problems. Together we can enhance our efforts to bring more of the resources of the community to the classroom, and in this way enrich both the teachers and the students.

Joint cooperation between industry and education and some mutual understanding on our part can help to resolve some of the most difficult and important problems that we have today, and we have lots of them. But to me the effective, and I emphasize that word *effective*, utilization as well as the improvement of our educational system is a mighty fine goal and a big problem. The good and effective staffing of our schools and our companies with motivated and educated people, leaders, is most important and a real problem—to find them, as well as to educate them and train them. In the final analysis we have to retreat to that classic definition of management—management is just getting things done through people, and I think educational management and industrial management have this in common more than anything else.

Education and industry can and must learn a great deal from each other. Only together can we cope with the problems, the changes and the challenges confronting all of us.

Let me describe to you how some of us here in California, both educators and businessmen, have actually organized to work together. Maybe this will open up some specific possibilities to you and your organization to plan and to assist in more widespread cooperation between industry and education, possibly along similar lines and possibly in other areas.

Some of you may have heard of our Southern California Industry Education Council or our Northern California Industry Education Council, but I suspect many may not. The fact that possibly quite a few of you have not heard or don't know much about this education council's efforts really doesn't disturb me because we have not sought publicity as such. We've tried to concentrate our efforts toward helping teachers and school administrators to reach the students and to motivate them.

A typical instance of industry avoiding publicity and trying to give credit where credit is due, happened several years ago when President Kennedy mentioned at a White House press conference in March 1962 that he personally was elated to hear of the Industry Education Council Career Guidance Center being conducted at that time in Los Angeles. At that time some 50,000 students were visiting a center which contained the greatest amount of occupational information ever presented at one time to young people and their parents. There was printed material about hundreds of occupations, all available under one roof. Even more important, during the time the center was in operation, hundreds of employers and persons who actually work in the occupations were on hand to discuss job requirements and opportunities individually with the young people and with the interested adults. When the President made this statement and talked about this, Fred Hartley, who is now President of Union Oil, was chairman of the event, and President of the Industrial Education Council. When Walter Cronkite and the Messrs. Huntley and Brinkley sought personal interviews with Fred Hartley, he declined the opportunity. He referred them to Dr. Trillingham, then and now Superintendent of Schools, Los Angeles County Schools, under whose auspices it was being held, even though the Industry Education Council did a tremendous amount of the organizing and presenting and making it go. The credit went to the Los Angeles County Schools; and Fred Hartley also suggested it might be better if the reporters and columnists discussed the whole thing with some of the students and the teachers and counselors in attendance to see how they felt about it. This was done and I think that's a pretty good indication. You might be interested, if you haven't heard, that at the Fifth Annual Career Guidance Center in Los Angeles last month, over 66,000 students and adults visited the center during a ten-day period. Practically all major business areas and business education areas had representation, especially those offering employment in technical, vocational and industrial fields; and so, with that sort of preface in mind, let me give you a little bit of history of the Southern California Education Industry Council which finally grew into both that and the Northern Council.

This started before Sputnik. It was a pioneer conference, held at the University of California Conference Center at Lake Arrowhead in the summer of 1957 and the attempt was to create a national pilot project, for trial. I think it turned out to be a history-making event. It was sponsored at that time by the National Academy of Sciences, National Science Foundation, the President's Committee on Manpower, many industrial organizations, including my company and Hughes Aircraft; American Association for the Advancement of Science, University of California—you name them, they were all there—industrial leaders and education leaders. The group realized that industry has a vital stake in the education of young people, not only for the general welfare of the young people and their parents, but also for the welfare of industry; because if there's anything industry needs more of and wants more of, it's trained, skilled, well-educated manpower and womanpower to assist industry in making good jobs for people. The conference charted a course of action in which the schools could and did draw on many industrial resources, both material and manpower, but in an organized, a planned effort, avoiding duplication. Today, this same Southern California Council and the Northern Council serve as clearing houses for educational action programs involving industy increasingly throughout the state.

The Southern California Council has affiliates or councils in practically every county in Southern California. What does it try to do? It tries first to provide the necessary communication between industries, businesses, and the schools. It stimulates and encourages various kinds of industry-education programs, based on the needs of the school, the needs of the student. It studies and recommends feasibility of various types of projects which will benefit school districts. There are many—42 different programs, not all of which are actively engaged in every school district; but some of which are actively engaged in many, many school districts and are growing all the time with regional workshops, advisory committees, planning and sponsoring of educational conferences, helping teachers reach students and motivate them, lecture-demonstration teams, and—here's one for you—helping the teacher image in the community. That's mighty important and a good job hasn't been done on it in the past. I think we all realize that in Europe, the status of the teacher is a very important one—teachers are looked up to, and rightly so.

In this country, for the last few years, at least, I don't think teachers have been looked up to as they should be. No matter what Johnny and Susie do, the teacher gets blamed. No matter what the problem is, Mom and Pop side with the students and run to the principal and it's all the teacher's fault. This can go on and on until the teachers get browbeaten over all of this and back off, and that's not good. The leaders in the community, in my opinion, are to blame for this, not the teachers. The problem is that the community leaders, who very often are businessmen, industrialists, politicians, manufacturers, as well as educators, etc,—those community leaders are not doing their job in understanding the teachers and seeing to it that the teachers are backed up and that the kids are made to recognize the value and the importance of the teachers. I feel very strongly about this and think it is indubitably in the best interests of the children; not that I'm unaware of the best interests of the teachers, but I believe in the best interests of the children just as you do; if you didn't, you wouldn't be teachers.

This industry-education program in Southern California has been very successful. Industry has supported the endeavor quite thoroughly. This is reflected in many surveys and I was surprised recently when there came a release from New York City which pointed out that industry-education cooperation in Southern California was a pacemaker in motivating students to achieve excellence. They said it, we didn't. One of the few places in the United States where the college enrollment in freshman engineering went up while it was going down everywhere else in the country is Southern California, and of course everybody said, "Oh, that's because there are so many engineers and scientists in Southern California." But when we investigated the situation we found that the per capita ratio of scientists and engineers was no different in Massachusetts and various other places; yet they were doing a lot more in motivating scientists and engineers—young ones—in Southern California. As you already may know, the start of this industry-education council was primarily to motivate youngsters to become scientists and engineers, and it was pretty doggoned successful. But I'm happy to tell you that it has long since tried to move away from science and engineering into many other fields; and so today, the industry-education councils are trying to work with the educators not only in science and engineering, but in motivating children to do whatever they can do, the best they can do it—to utilize to the maximum degree whatever brains the student may have received from God and from his parents. Now this is a worthwhile effort. For some reason which is not too clear to me, and which I hope you will understand and help us with, industry is not working as well and as completely with industrial arts as it should, and that's why I'm so pleased to have this opportunity to talk to you.

The President of the Chamber of Commerce of the United States, Bob Gerholtz, at a national Chamber of Commerce meeting, stated, "Southern California Industry Education Council is inspiring imitation in communities far and wide across the country."

It was nice of him to say so, but I'm not very happy because I don't think we're doing enough of it. I wish we could inspire more imitation in more places, because the successes have been good. Take our teacher-for-a-day program—March 25, this year—when over 900 businessmen, scientists, engineers, etc., from industries and businesses throughout Southern California conducted classes for one afternoon to enable an equal number of faculty members—mostly science teachers, of course—to attend a regional conference of the National Biology Teachers Association. It turned out very well. But why have we not had teachers-for-a-day in industrial arts? Why only in sciences? Well, we can't plant it alone—you've got to plant it, too.

We have a medalist award program which I think is unique. This program recognizes a senior student from each high school who has inspired others by his or her schooling and moral examples, making real efforts to meet future challenges. This medalist award rewards students working to the fullest of their ability, not necessaruly those who achieve the highest academic grades. A *C* student who really stirs his stumps and works hard and achieves a B may be far more worthy of an award than the one who gets straight A's—easy, one hand, no problem.

This may be one of the few times that this motivated achiever (but not necessarily high-academic-success student) may be recognized and rewarded for the effort and applauded for it. And if there's any better way to stimulate kids to make an effort than to pat them on the back, I don't know what it is.

We have a Salute to Education banquet once a year in December. The program addresses itself to recognizing individual teachers who have distinguished themselves in their classrooms and who exemplify the many classroom teachers whose dedication is making California's educational system better and better. Industrial arts teachers have been the recipients of this honor. The awards for the past two years have been presented by the President of the U.S. Chamber of Commerce. Let me make an important point here. Industry-education council efforts do not conflict in any way with methods and programs of chambers of commerce or boards of trade, local, state or national. The principle is to work cooperatively and helpfully to avoid this duplication. We honestly don't care in our industry-education council who does a job or who gets credit for it, just so it gets done. We try to maintain good permanent relations with education through ups and downs. You know, sometimes its fashionable and appropriate to salute education and then everybody forgets about it for several years. You have to do it consistently, in my opinion, and we have been pretty consistent. We've maintained this thing on a steadily rising curve, possibly by two simple and basic policies.

Our industry-education council has not taken and will not take positions on purely political matters. We think you should keep politics out of it and then you can truly get on with nonpartisan and effective education. We will not concern ourselves with matters of school curriculum unless we are especially requested to do so by the local school superintendent or school board president.

In other words, we in industry-education council are not going to try to tell you how to do your job. We want you to tell us how *you* want to do your job, and then let us help you. . . . It's all too easy to criticize, and we need good critics. But I think we need more people trying to communicate with each other, to understand each other and help each other, and the great American pastime of being actively critical over almost everything should have some limit to it.

There are some other things we do: Summer employment for teachers, summer employment that may help them in their own goals, in vocational guidance and in what they plan to do in the schools here. We have summer workshops for state colleges, over 50 sponsored workshops for teachers. Of course we have plant tours and local courses for Career Day and all that sort of thing. I think perhaps I can best sum up the council's activities by saying that we have stood and we do stand ready to meet all requests for cooperation which we may receive from education. As far as I know, the council has never failed to fulfill in some way any reasonable school request. Our boards of directors are made up half from education and half from industry. The president of our council is a leading educator one year, a leading industrialist the next.

Industry-education cooperation can be available in every community in the United States. It is not now, and you can do a lot about it. You can seek out your local industrial leaders, and you can get support and understanding from them in accordance with the principles we've discussed.

I'm not talking about money, because money doesn't do the job. I'm continually amazed and continually pleased at the large numbers of teachers and young people that we reach through the industry education council at an almost infinitesimal cost per capita. The annual budget of the entire Southern California Industry and Education Council is less than $40,000 a year, and we reach hundreds of thousands of children and thousands of teachers.

In California, you can and I hope you will participate to a higher degree than you have in local programs. Outside of California, I hope you will spread the word and be of help in forming your own school industry-education councils—not necessarily like the Southern California one, but industry-education councils which are geared to your local problems and the local problems of industry in your area. Why don't we organize a teacher-for-a-day in the industrial arts field? Why don't we organize something in which we can have industry replace industrial arts teachers even for half a day and give them a chance to get together and talk it over. They'll each learn something additional. It isn't too early to do a little thinking and planning for that.

Regarding work experience—perhaps you could suggest some new way of putting work experience into action. The initiative with vision. And perhaps you can help in proving to industry that the time, effort, and personnel they may give to industry-education cooperation is necessary for them, that they will get more out of it than they put into it. I believe they will—I believe my company has gotten a great deal more out of it than it's put into it. The others would feel the same way if there were ways in which together we could educate them and convince them.

Some specific suggestions are industry's role in emphasizing the assistance needed in the industrial arts. There is a real need for this. We need some new looks along with the older ones of tradition—not that traditions aren't good and necessary things in some cases. But one of the most stultifying things in industry—believe me—is when the people do the same thing day after day because that's what they did yesterday and that's what they did last year. Any industrial organizations which go on doing the same thing, year after year, that they did the year before, don't last long in this new society of ours. There is a necessity for constant review of the purposes and operational meaning of industrial arts education, just as every industrial outfit has to consistently review and bring up to date its goals and its organization.

I'd like to give you an insight into one innovation, just briefly—at La Cañada High School in California. They instituted an industrial research and development laboratory. This laboratory serves as a site for the effective and practical application of a number of theories explored in other related fields, whether it's physics, chemistry, mathematics, biology or whatever, but it is under the supervision of the industrial research lab instructor. Students are encouraged to come in and to investigate areas of individual interest. Of course they have to get permission from the instructor before they come in to use the laboratory, but they get to know, they get to understand necessary tools, necessary machine skills, necessary knowledge of tools and things available. Scientific method, sure; independent research and examination, sure; theorems, of course; films dedicated to promoting some creative thinking—presenting some new ideas, showing some industrial methods and procedures; and every now and then, guest speakers. Field trips, of course. All this worked out very well at La Cañada High School. It really did the job, it got those youngsters thinking—interested—motivated—active. And wanting to learn. And that is really worth doing.

Now, let me ask you a question: You are industrial arts administrators and teachers. But do you really know much about industry? Maybe that's an insult and if it is, then I apologize. But I just wonder if you do. Can you avoid making sweeping generalizations about industry—which are not true? Can industry avoid making sweeping generalizations about education which are not true? One of the real frontiers in industrial arts, and I read about frontiers in your national magazine—one of the real frontiers of industrial arts is truely knowing something about your local business and industry. One thing that many of us have learned from our industry-education council activities is that (*personal*) contact between local industry and local education gives the greatest returns; and it gives the greatest returns, also, if it's well organized and well managed. Many of you know people in industry who represent manufacturers of equipment or publications which you use, and that's very fine. The exhibits that I saw here as I walked around are excellent; they're worthwhile, and I noticed that many of you had a real interest in these exhibits, and so you should. But I don't consider that as being contact with industry. How many of you have wider personal contacts with your local industries who need and use the products of our schools? I can tell you that industries lack knowledge about you; and if industries lack knowledge about you, I suspect you lack knowledge about industries.

How many realize these days that more and more companies are giving blue collar employees much greater responsibility? Some call it permissive management, some call it participating management, and some old die-hards call it promiscuous management. Some call it theoretical, but it appears to be gaining favor rapidly, and I'm for it. Its hoped-for and often-achieved goals are from this promiscuous or participating management; something we need, and that is—more responsibility and a greater sense of importance for lower level, or blue collar if you prefer, employees; which leads in turn to that most important thing, pride in workmanship. It used to be that all good craftsmen had real pride in their workmanship. Such folks are getting harder and harder to find—at least they are in industry. Maybe that's what they do in their backyard garages but they don't come to work and do it very often.

If we can find ways to get back to this pride in craftsmanship, this belief in oneself, this sharing of responsibility with employees, this will lead to increased productivity, reduced absenteeism, reduced turnover, stimulation of good cost-cutting suggestions from the people who are doing the work. This means greater competition, better competition, it means higher profits. Today companies are teams of people. A company which doesn't appreciate this and practice it doesn't get very far these days. From the president right on through to the folks who sweep up the factory on the second or third shift, each and every one is important. Each has an important and vital role to play. A factory that's filthy, that isn't swept up properly and regularly, usually is disorganized, usually has a high accident rate, and usually doesn't get the stuff out on time.

There have been the traditional comic-strip bosses. We've all read about them, we constantly do, but I'll tell you from my insight in industry that the comic-strip boss is about as gone a thing as the Dodo in real industry. The majority of managers these days are professional people. They're professional managers, they're professional leaders. They're studying and trying, even though nobody's educating them, to educate themselves in leadership. And that means the understanding of people.

Some of the curriculum revision now going on may need a little business support to insure better understanding of the importance of early identification of aptitudes, and a better comprehension of the function and importance of what we can do with industrial arts. As Max Rafferty said earlier, we need a little more on attitude as well as aptitude; and it would be a pretty worthwhile goal for any curriculum development group, in view of the really critical trained manpower shortages that are looming up in many places, to have a little conversation and a little understanding with the people who are going to use the output. This will help to improve that image I was talking about—your own personal image. I regret to say again—and that's why I have said it several times, to emphasize it—industry in most areas is less informed on industrial arts as a field of teaching and study than you might think. I regret to report again that many of my business and industry coleagues, in large and small corporations, have little or no appreciation or understanding of what you're doing and what you're trying to do. They need education by *you*. This calls for some speaking up and speaking out. This calls for some personal contact. Of course, this might contribute to the shortage of qualified industrial arts teachers if they all hire you in industry, but maybe this isn't too bad a thing either, although I hope it doesn't happen.

Lets look at another factor. There's a recent survey by the Chamber of Commerce of the United States. John Harlan, Director of Manpower Development and Training of the U.S. Chamber, found that some 90 per cent of the executives noted that their business members are suffering from shortages of skilled manpower and that industrial arts teachers, supervisors and directors were not communicating with the business leadership. These certainly are facts to show why too many of our youngsters are still dropping out before the completion of high school. An aggressive, practical program of industrial arts, properly instituted and backed up, with some cooperation from local industry would help to deter many of these youngsters from the seventh grade up, from dropping out. It would result in a lot more fine and useful citizens.

There are many examples of these problems. A number of them were detailed in the *Wall Street Journal* about three weeks ago. We all know that auto repairs are suffering more and more, that we need more and more people to do something about it. There are lots of places where, if we understood it better, we could do a better job. There are people interested in you, interested in industrial arts, interested in understanding you better, who want to help you. You might want to secure from the Chamber of Commerce of the U.S. what might be a pretty good merchandising tool for industrial arts, for use by the industrial arts teachers, entitled "Industrial Arts: An Answer to Training Needs of Business." Why not give this a thought: Why not select maybe five or six of what you consider to be the most important corporate executives in your community, that might employ some of your students in the future, and maybe armed with this U.S. Chamber of Commerce supplement, find out why they wouldn't wish to form a small committee of themselves and you, to start a plan in your own community of bringing the resources of industry to the industrial arts classroom. You can do it. But don't sit around and wait for industry to do it, even though a few of us are trying to spread the word and make some efforts; I encourage you to do something on it too. *Ask* for it. I don't think you teachers in California have too tough a job because as I said before, any time the industry-education council has been asked to cooperate with education and help, it has done so. And it can do some more and do so again.

Understanding the industrial arts education responsibility toward the community is important. Developing effective means of communication between potential employees and boards of education is important. Determining the competencies that schools should provide, and what potential employees they should provide, is valuable; and improving the image of industrial arts education, and so on. These things are really important, and I don't feel that they are getting through, I don't feel that they are getting the job done as much as I'd like. Motivating adults is not an easy thing. But kids are not that way. Even when we have second- and third-generation unemployed, the Head-Start program has shown that it is possible to interrupt that, to divert it; it is possible to reach the kids even when they have been second- and third-generation unemployable. Unemployables are something we hear a lot about—there are too many of them. We're beginning to understand why we have so many of them and the principal thing is lack of motivation, as far as I can find out. Many people have asked me, "How do you motivate children?" Of course, I'm smart enough to tell them I don't know, but I do know this: Purely by empirical experience, I find that if you take unmotivated children and put them in close physical, mental, spiritual communication with highly motivated adults, about 85 percent of the time, by some process of osmosis or whatever, you get motivated kids. Of course, 15 percent of the time, you get frustrated adults. But this doesn't worry me, because remember—I started on the premise that we were dealing in this case only with motivated adults, and motivated adults survive frustration even if unmotivated kids don't.

Other people have said, "What is it industry wants in an educated or trained person?" I don't think that industry wants highly trained operators of sophisticated machinery because the machinery changes so fast that no matter how you train them, we have to train them differently. On the contrary, in my judgment what industry wants in trained and educated man- and womanpower is youngsters that are educated in only three things. If you want to add a little something, that's all right, but in these three things, please educate them: Educate them first to think. Use it. Don't abuse it. *Educate them to think.* Secondly, educate them to understand what's going on around them, to have an interest in what's going on around them. *Educate them in the ability and willingness to understand.* And finally, teach them *how to communicate.* I don't care how high the IQ, I don't care how educated, how erudite or whatever; if you can't communicate it after you've got it, it's no good to you and it's no good to anybody. But please, you fine, wonderful industrial arts folks, you have this great opportunity, you have this great potential. See what you can do to encourage teaching in how to think, how to understand, and how to communicate.

Let me suggest something about leadership training. Where real leadership training can begin is right in industrial arts. Maybe that's too big an order but I don't think so. In my judgment and experience, leadership training can and should begin with a firm, well-articulated set of usable personal values. Secondly, some training is necessary in the art of decision-making based upon these personal values—we have to train people in the art of decision-making and it is an art, not a science.

Develop initiative. And you'd be surprised where initiative can be found if you make an effort to seek it. . . . Personal self-confidence—a strong self-structure that can withstand some of these conflicting, frustrating pressures. A little self-sufficiency. A little pride in personal adequacy. Some independent thought and action. Some pride in one's own individualism. This is all part of leadership training, in my opinion. These things are present in every teacher who is a successful teacher, these things are part of you. I think many of our problems come from immature teachers just as many of our business problems come from immature company presidents. This is another thing teachers and company presidents can have in common—immaturity as well as maturity. You need training to resist temptation. You need motivation and encouragement.

Another thing, drop-out after drop-out—and I know you've had this experience—always expressed the idea that they couldn't see any practical use for what they were trying to learn. This just means they haven't been approached appropriately in the beginning, at least in my opinion, and I think that's the role of industrial arts. Some say it's general education that teaches values and orients students toward the industrial world. I think it's true in every sense, but it's not enough. This is a greater opportunity that you gave, which I hope you will take, and will work with industry to understand a little bit better. I think your Association can help as well as you individually, and I encourage this—I encourage it strongly.

As leaders in your community—you are leaders in your community, and if you're not, you should be—I challenge you to attack our nation's most serious problem. I consider this the motivating of students, in both primary and secondary schools—motivating children to want to learn. They can, if they are motivated. School people like yourselves have been pacemakers in America for ingenuity and initiative. I believe you are leaders and I believe you can provide the leadership we're talking about. In continued education efforts in these matters, you will reap personal rewards and personal satisfactions which are tremendous. For that reason, I salute you and wish you all the best. ■

Symposia

Implementing Frontier Ideas in Industrial Arts Education By Teachers, Supervisors, and Teacher Educators

Symposium A

ROLAND F. NAGEL

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Frontier ideas in industrial arts, if they can be properly identified and implemented, will in most instances need to be first initiated at the teacher preparation stage. A current example that seems to substantiate this statement is the American Industries Project at Stout State University. While the project is currently "re-orientating" industrial arts teachers to the American industries approach in order that the program may proceed, an entirely new teacher preparation curriculum has been prepared for the future teachers of this curriculum area. To project this new approach on many industrial arts teachers today would be as disastrous as were the outcomes of over a decade ago when the comprehensive general shop approach was introduced to teachers of unit manual training courses. It was only when new teachers had themselves experienced the content and methods of teaching such a new idea that the true interpretation of the then "shop innovation" or "frontier idea" was ever achieved. The old adage, "we teach as we've been taught," is as true today as when the phrase was first coined.

How and in what ways can industrial arts teacher education contribute to the development and understanding of or implement frontier ideas of today; also what changes need to be made? It must be understood at the outset that what is new for some may have already been attempted or is being practiced today by others.

1. In the development of ability to meet new situations, with emphasis on the how to learn, industrial arts teacher education needs to place greater stress on the individual's responsibility to solve current problems so that this idea will be transmitted to the students of these future teachers. More emphasis on individual research projects or activities on the part of undergraduate students, as well as graduate students, would aid in this developmental task.

2. New methods of teaching industrial arts need to be discovered, developed, and used. Methods which will be effective for large classes (35 to 40 students) are needed as well as methods which will satisfy new curriculum concepts. Perhaps the full-year intern teacher approach to teacher preparation (student teacher works under master teacher for full year) would help to satisfy this need. Staff team teaching has never been fully tested at the teacher education level and could also be an answer.

3. There is also a need for new concepts concerning facilities for industrial arts offerings which may have reference to "new institutions" as discussed by Dr. Tyler. These concepts must, of course, be congruent with the ideas one has of the industrial arts curriculum which in turn dictates the housing and equipment needs. However, if classes are as large as 35 students, and some are or will be, if research, experimentation, technical knowledge and concept building become important in industrial arts, then perhaps facilities which are adaptable, versatile, and expandable need to be provided. However handicapped teacher training institutions have been, industrial arts teacher education must lead the way in this area.

4. Industrial arts, it seems, needs no reversal of the curriculum as was suggested for some areas by Dr. Tyler. In most instances industrial arts has always provided the concrete experiences first; however, not always was each experience fully associated or correlated with the basic or abstract concept taught. What was done was more important than what was learned or how the task was accomplished. This has been true, all too often, in industrial arts teacher education. The approach, however, must not be altered if industrial arts is to meet the needs of those individuals most in need of this curricular area.

5. Industrial arts teacher education must also be concerned with the education of parents, or in a broader sense with adult education, the concept of which is only in its infancy. Education for leisure activities, attitudes toward work and education for work are also important aspects in the preparation of industrial arts teachers. ■

MARK JONES

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Webster's Dictionary states that to interrelate is to have mutual relationship. Industrial arts teachers have long acknowledged the mutual relationships which exist between industrial arts and the other subject-matter areas. Every industrial arts teacher has exploited numerous opportunities to interweave content material from other subject-matter areas into learning experiences being presented in the industrial arts program.

I can recall my first year's teaching experience during which time I gave tool identification tests to my students and, of course, required them to use the correct spelling for each tool while they answered the test. I also required students to do reading research in such areas as: the mining and smelting of copper, the smelting of iron ore, foundry techniques, storage and dry cell battery construction, electricity, electronics, etc. Some of these reading research tasks were presented as written assignments, and others were given as oral reports.

Students were also trained in good citizenship habits through the use of such class techniques as: (1) a rotating clean-up schedule which required each student to accept responsibility; (2) a rotating shop foreman who was responsible to see to it that the cleaning schedule was maintained, and (3) individual or group projects for which each individual bore some responsibility. These are just some of the activities which every industrial arts teacher has used during the course of his teaching career. Every industrial arts teacher realizes the importance of building interrelationships between industrial arts and the other subject-matter areas in order that a higher quality of motivation might be achieved in individual students.

Probably mathematics and science are most directly interrelated with the industrial arts programs of our schools. These two subject-matter areas are most often interwoven into industrial arts learning experiences.

Certainly, one can find many examples of interrelationships between these areas and the industrial arts program.

I wish to present two publications by the California State Department of Education: *Mathematics and Industrial Arts Education,* and *Industrial Arts and Science.* While these publications were being formulated, teachers and supervisors of industrial arts, mathematics, and science worked on committees, and it was amazing to see the number of practical applications that could be found in industrial arts classes.

Another source which presents many interrelationships between industrial arts and science is the publication, *You and Science,* by Harcourt, Brace & World. A review of this and newer science publications currently available reveals a trend by authors and publishers of devoting more attention to units of science content which bear many interrelationships with industrial arts programs.

The technological aspects of science which may be easily interrelated with the industrial arts program are currently being emphasized. I would like to encourage industrial arts teachers to review the latest science textbooks in an effort to find new ways of building interrelationships. It should be pointed out that few teachers of industrial arts emphasize skill development without including some interrelationships to other subject-matter areas. Also, many teachers in such disciplines as English, science, mathematics, and social studies in elementary and secondary schools, are using industrial arts materials as a source of pupil motivation.

Let us look at several outstanding examples of how school districts have built instructional programs which stress the interrelationships between industrial arts and the other subject-matter areas:

San Bernardino City

- primarily a 10th, 11th and 12th grade program
- English classes emphasize the 100 most-used technical terms
- reading specialists help students increase their vocabulary by stressing word meanings and providing practice in the use of these words in reference work

Martinez

- 9th grade program in three junior high schools
- stresses industrial arts interrelationship with science, mathematics, English, and social studies
- utilizes a team-teaching approach

Grant Union District—Rio Linda High School

- industrial arts interrelated with English
- English class for nonachievers initiated this program
- English teachers have 13 classes that concentrate on reading, writing and oral reports interrelated with the learning expericences provided in the industrial arts program

Oakland City—Bret Harte Junior High School

- a 9th grade program
- an initial survey showed that boys who were constantly truant all possessed a common interest in small engines: i.e., lawnmovers, outboard motors, etc.
- a special class in power mechanics organized for boys
- a core program in which one teacher stays with students for three hours and interrelates reading, writing, and arithmetic
- since its initiation only two boys were ever truant
- a most successful and unusual program

Pre-Technology Plan ("Richmond Plan")

- total approach to curriculum through the interdisciplinary process
- originally started in Richmond—now expanded to 13 secondary schools in the Bay Area
- an 11th and 12th grade program designed for the capable "average" students who take mathematics, science, technology laboratory, drafting, and English
- requires a course in social studies
- basic college preparatory content is presented—emphasizing application of technological principles
- English prepares the student to write professional technical reports—emphasizing the value of good English usage
- the central feature is the industrial arts technology laboratory where students work separately and/or in teams to solve problems related to technology
- students and teachers work together in developing projects
- mathematics teacher guides the student in necessary mathematics
- science teacher presents the theoretical background for projects
- in English the student also prepares oral and written reports of his progress
- the drafting class designs the project used in the technology laboratory
- the technology laboratory develops industrial arts skills which facilitate the construction and testing of solutions to problems
- all of the program develops around team teaching and team planning
- further development of the pre-technological idea is being expanded to ten more schools in the near future
- the Ford Foundation has created a center for technological education in San Francisco to further develop this interdisciplinary process under the directorship of Dr. George Champion.

San Mateo—Crestmoor High School

- a mathematics, English, and industrial arts interrelated program
- begun in the summer of 1965
- (a more detailed description will be presented later in the program)

Federal Proposal

- patterned after part of the Oakland Bret Harte Program
- planning an interrelated multi-discipline curriculum for the 9th grade
- the English, mathematics, science, and industrial arts teachers plan together on Saturdays
- would include five schools in five school districts and encompass three counties in the Central Valley—400 students would be involved in the initial program with a future potential of 4,500 students
- industrial arts teachers would write a power mechanics course of study, listing the required tools and equipment
- for teachers in each of the four subject areas, five coordinators and two directors
- each of the discipline groups would see how they could interrelate information which might be used in an exemplary program implementing a new class the following year

We all hope that The National Defense Education Act, Title II, will include industrial arts in the near future and make possible the funding of many such programs.

These examples strongly emphasize the importance of the existing interrelationships between industrial arts and the other subject-matter areas in the total program of the school. Most of these programs have been developed through continuous efforts by educators to meet the needs of individual students. We are currently engaged in a primary effort to develop an industrial arts program which will meet students' needs for life in a changing world. I would challenge each of you to give much thought to four essential student needs during your planning activities. These are:

(1) help students learn how to retrieve information;
(2) help students learn how to think by providing them with real-life problems for solution and providing guidance in the solution of these problems;
(3) help students learn how to learn by causing them to develop those learning skills and techniques which productively provide reliable answers to real problems; and
(4) help students learn how to adapt to change and help them learn to expect changes in the future.

In closing, I would like to emphasize the need for building interrelationships between industrial arts and the other subject-matter areas. I am certain that each of you can see that we are moving forward toward new frontiers in industrial education. The building of interrelationships with other subject-matter areas is a big part of the current industrial arts movement in California. ■

WESTON T. BROOKS

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There is no doubt that the technological changes presently occurring will place new demands on education. This is true of education in general and also presents some very pertinent questions as to the future of industrial arts education.

By 1970 over half of the population in the United States will be under 25 years of age. Certainly there will be tremendous opportunities for the young people of our nation. These wonderful opportunities will not simply occur without careful planning and effort on the part of the various educational institutions at all levels. The how and what elements both seem to be very crucial questions which need to be explored.

The how-to-learn phase of our educational system has probably received very little emphasis. However, the what to learn, the basic content of our curriculum, must be given due consideration. The what to learn will by necessity serve as the vehicle to teach the students how learning is accomplished. There is considerable doubt that any discipline will disregard the basic subject matter content in preference to stressing only the approach to learning. Certain fundamentals within almost every area will remain constant and desirable to teach, regardless of the rapidity of technological changes. The what-to-learn phase of our educational programs must be continuously evaluated and supplemented in order to truly emphasize the how-to-learn techniques.

In order to make any program more meaningful to the students, teachers will certainly need to experiment with various approaches. This experimentation or flexibility seems to be one of the teachers' chief objectives or obligations to the students and the teaching profession. Through professional organizations, continuous in-service-training programs, and active public relations programs many of the problems presently facing teachers in this rapidly changing society can be overcome. ■

Symposium B

JAMES BIGNELL

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Tampa, Florida

As Dr. Tyler puts it, "The emphasis is now on the ability to meet new situations, on *how,* not *what* to learn." One reason for this is the ever-changing world and rapid development in almost every direction, but especially in the technical world. What is good know-how today may soon be out of date. A harness and buggy-whip-maker was a good trade for one with the know-how, but today it's not good at all. If his education had been general, however, or as Dr. Tyler puts it—*how* not *what,* he would be OK today—he could have been a shoemaker when the horse and buggy went out or one of a hundred and one other thing.

The type of general education offered by industrial arts is the answer for today's rapidly changing world. Industrial arts does not teach a trade, but it gives the student that *basic technical education* that will fit him for all fields of technology. He gets a broad understanding of the basic facts, formulas, and ideas in back of technology in general. He learns woods, its tools, its uses, etc. He learns metals, electricity, electronics, crafts, drafting, etc. These are the foundation upon which our modern world of technology is built.

Since I don't have space or time here to elaborate on each field, I will take only one as an example—that of drafting. In this, the industrial arts drafting students learn the reading and writing of the technical world. Every technical thing of much importance is first put down as a drawing; often referred to as the blueprint. Then it must be read by the technicians; therefore, we see it is the reading and writing of the technical world. Without a knowledge of this subject, a person is *technically illiterate* in today's world. Much the same line of reasoning can be set up for all the other fields of industrial arts. Industrial arts is basic. Industrial arts is fundamental. Industrial arts is a must for every educated person today. Yet our schools put it in an elective role. When are we going to realize we are living in a technical world where everyone must know basic facts upon which he can build? The old education of the old colleges that taught liberal arts, theology, Greek, Latin, and others are now antiquated and behind the times, and must be supplemented today with the learning of modern technology or the student is not truly educated to meet today's demands. Not only are the unskilled workers disappearing and giving way to highly trained technicians, but the white collar worker is giving way to the computer and the brain machines. It all goes with this ever-changing world. Education must keep up with it or be lost. The answer is industrial arts as a *must* for everyone's education, to give him a basic foundation on which to build whatever future comes his way.

At one time the farmer was classified with the unskilled laborer, but today he is anything but unskilled. He is a paradox, he is an executive. He manages more capital than most so-called businessmen. He is a purchasing agent, buying thousands of dollars worth of equipment, feeds, seed, etc. each year. He must have the knowledge and know-how of a Philadelphia lawyer to be able to read and understand the long and complicated government farm programs, income tax regulations, etc. He's not only a businessman, etc., but he is a scientist, using chemical fertilizers, antibiotics, chemical weed killers, chemical insecticides, etc. He must have a good knowledge of agronomy, entomology, and many others. He must be a machinist, a mechanic, a surveyor, a blueprint reader, etc. The age of the unskilled farmer has gone. And is just one example of many in this changing world.

This brings out the need for an education for such an individual. His school education must be general; it must be basic and cover all fields. This is not only true for today's farmer, it is also true for almost all people today. It's not learning *what* so much as *how* that we need today and this *is* industrial arts. His education must be of such a nature that he can adapt to whatever the future brings, and this is our modern philosophy behind industrial arts. ■

STEPHEN W. MINDOCK

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My first reaction to Dr. Tyler's presentation is the magnitude and implication of modern technology and its wide scope of influence over all of us. It envelops and alters our personal life. It places emphasis on how to meet new situations, adapt quickly, meet non-material needs of people, provide for human relations, reverse the curriculum by placing the practical before the abstract, and make our program in industrial arts more meaningful, yet ever flexible. Population increases mean more technology which in turn begets more education. The changes are subtle but we are made aware of the fact that as all facets of our life become more institutionalized, problems dealing with impersonality and frustration are created.

New concepts in our basic thinking are required. As educators we must first change our own way of thinking before we can expect to influence and create behavior changes in students and parents. The key to all of this is the classroom teacher. The problem is how to create the atmosphere for the teacher to learn, and to become motivated enough himself to want to present frontier ideas to students and parents that will enable them to cope with our technological society.

Before we surge ahead and attempt changes in our curriculum we should take stock of our objectives, evaluate and change them where necessary and then move ahead. Analyzing the four objectives of industrial arts of the American Council of Industrial Arts Supervisors, I find we are on solid ground except for the exclusion of provision for leisure activities. The recreation-leisure explosion is here now.

Dr. Tyler has pointed it out. Congress is aware of the problem as indicated by passage of the Wilderness Areas law last year. Churches are alerted to future implications of leisure as evidenced by this month's publication of "Mission in the American Outdoors" edited by Gilles Ekola. Expressing the concern of the church in leisure-recreation, the book states: "Churches cannot neglect leisure and recreation if they seek to serve man in the context of life today." We are well aware of labor's concern with better human relations and the associated importance of satisfactory leisure activity.

By its very nature our own field of industrial arts education provides freedom to the student and instructor to experiment and make changes adaptable to technological life—this is in our favor. Let us see how industrial arts can be adapted toward this end.

A simple illustration will be appropriate. This illustration also serves as an example of combining practical experiences to help grasp abstract concepts.

A pet project of mine has always been the magnetic compass for 7th-8th grade boys to provide an understanding of permanent magnetism. There are many basic operations involved in making the needle, annealing, magnetizing, and hardening, along with other metal and woodworking operations involved in making the case. By itself this project has considerable appeal, but the real eye-sparkling interest came out when I'd bring my rucksack to school and lay out contents I considered proper equipment for a few nights in the mountains for either climbing, hiking, fishing or cross-country skiing.

I made a point of having an assortment of compasses for display, the lensatic, Silva, watch, and wrist. The questions started to fly as the youngsters compared their simple models to the flashier commercial ones which they wanted to know more about. The next step was to pull out a topographical map of Rocky Mountain National Park and show them how their compass was just as good as the others in orienting the map. We then got into the details of how to use a compass with a map and set up hypothetical situations of what to do if lost. This of course required learning more about the map, such as contour lines, scales and symbols. Interest ran high when a map of Colorado with wilderness and wild areas depicted in color was shown.

The point here is that practically every junior high school boy does have some natural feeling for the outdoors. The motivation is there. It's just a matter of knowing how to capture it. They had no difficulty learning and remembering the basic law of magnetism and the lesson was carried on into something with which they will always be concerned.

Students retain ideas put to practical use. The laboratory may be the outdoors or it may be industry. The main thing is to stimulate thinking and encourage the student to look beyond. Taught to do this he will have less difficulty coping with change. ■

Symposium C

DR. DELMAR W. OLSON

Chairman, Department of Industrial Arts, Kent State University
Kent, Ohio

The following are proposals for implementing the frontier ideas in education as proposed by Dr. Ralph W. Tyler. They are by no means exhaustive; only suggestive of the possibility of many others.

1. The Tyler Idea: Emphasis is on ability to meet new situations, on how, not what to learn.
   Implementation:
   a. Teaching methodology must emphasize principle instead of process. Principles, theories, concepts, ideas become the subject matter, the fundamentals. Industrial arts is traditionally process-oriented. Processes now serve to illustrate principles, theories, concepts, ideas.
   b. Teaching methodology must emphasize how to think, how to ideate, how to create. Thinking begins with a problem. Problems are solved through research and experimentation. Ideas are dreamed in an environment of imagination (the new industrial arts laboratory). Creativity results as the teacher directs a continuing search for a better way.
2. The Tyler idea: Develop new institutions to accomplish the new tasks.
   Implementation:
   A new institution for the preparation of industrial arts teachers may

have to be established within the framework of existing institutions of higher education. It may take several forms.

a. The entire department of industrial arts may go experimental. Every course will emphasize creative, experimental expression. Each project will be an experiment in search of a better way.
b. When the above is not possible individual or small groups of frontier-type instructors can develop experimental programs.
c. The American Council for Industrial Arts Teacher Education should support the establishment of a new type of graduate program on an experimental and pilot basis.

3. The Tyler idea: Make the program as meaningful as possible to the students.
   Implementation:
   a. Student teaching experience should be provided during each of the four years of the undergraduate program, and not left until the senior year. The student needs this experience as a freshman for occupational try-out. He needs teaching experience before he takes courses in methods if they will be most real and meaningful to him.
   b. Every project should be a design-problem-experience in search of the unknown, the new, the better in material, process, and function.
4. The Tyler idea: Reversal of the curriculum—placing concrete experience before abstract concepts.
   Implementation:
   a. Methods and organization in teaching and curriculum should emphasize the psychological instead of the logical. The student should learn technical fundamentals integrated into real design problems, not in a graded series of exercises.
   b. Formal instruction should follow the student's realization and recognition of problems rather than precede it.
5. The Tyler idea: Flexibility is a real value in the development of a curriculum.
   Implementation:
   a. The industrial arts curriculum and its every course must be open-ended so that each individual can be reached with personalized instruction. Formalized, mechanized courses must be replaced with courses in which the subject matter changes as the technology and the students change. Single material-oriented courses have served their usefulness. The best solutions to problems and projects cannot necessarily be made of a single material.
   b. Since the future is unkown, the best educational preparation for it is the development of interest in a continuing education; the best education for work is that which is directed toward a series of careers rather than one. ■

LAWRENCE F. H. ZANE

Honolulu Technical School

Honolulu, Hawaii

Vice President Hubert H. Humphrey, in the January-February 1966 issue of our *JOURNAL*, described the Great Society as "a state of Opportunity." Dr. Tyler has described some of the effects of technology on the education of the young people of today and has pointed out some opportunities—opportunities for those in industrial arts to "act."

Since our educational system is trained to provide the high level of education required by our society's productive activity, why not approach the teaching of courses in history such as the History of Industrial Arts, the History of Technology, the History of Vocational Education, etc., beginning with a selective study of historical events, issues, and movements of a contemporary nature rather than beginning with a study of Socrates and his attitude toward the mechanic arts? Emphasis would be placed on current events although materials used in analyzing the event would be taken from its historical past. The traditional, chronological method of teaching this subject would not be completely ignored. Events leading to the selected contemporary topic would need to be covered. This approach would attempt to show concrete experiences of the present, followed by the more vicarious experiences of the past. An example would be to study the Elementary and Secondary School Education Act of 1965 and its omnibus effects as now seen and to discuss the events leading to the passage of the bill. In addition, one could probably cover the Vocational Act of 1963 and its preceding events far more adequately than beginning with the Land Grant Act of 1862 and moving to the present. This method of approach could provide the *opportunity* to select materials and experiences which are currently important and functional and which would help to make the program as meaningful as possible for students.

Dr. Tyler emphasized the need to teach individuals the ability to meet new situations. Why not try to develop the problem-solving technique in our students as a means of meeting new situations? With the accelerating amount of knowledge available, industrial arts cannot hope to cover the entire range of subject matter, but it can try to teach the concepts of problem-solving. The application of problem-solving techniques in some form may be found in most industries—the research and experimentation laboratory specializes in this area of work. What better environment than the industrial arts laboratory to engage in this activity? Not only would research and experimentation in industrial arts provide an orientation to industry, it would also provide one of the avenues of teaching students to meet the many new situations that will arise in their future. Industrial educators could use this program as an *opportunity* to implement changes.

Another avenue of approach to the reversal of the curriculum would be to allow our potential teachers to engage in observation-participation during their first year of teaching. Perhaps this period can serve to motivate if not enlighten our future industrial arts teachers.

This experience would allow him to observe, allow him to teach, and allow him to be exposed before a class—give him the status of a teacher. The University of Hawaii has for many years required its potential teachers to take observation-participation in the junior year. This has been very successful. Others, perhaps, have used this procedure, but why not move it to the freshman year? Give our industrial arts teacher the *opportunity* to gain concrete experiences in teaching before some of the abstract work in college. The experience in teaching a lesson in electronics could make him aware of what he is expected to know in a course in college algebra or calculus.

Could you implement these fundamental ideas into your curriculum? Could you at least toss these ideas to your fellow staff members as "food for thought"?

John F. Friese, in his most recent book said, "Heavenly Father, give us serenity to accept what cannot be changed, courage to change what should be changed, and wisdom to know one from the other."

Then, shall we *change?* ■

STERLING D. PETERSON

Minneapolis Public Schools
Minneapolis, Minnesota

A frontier in industrial arts education that must be expanded is in the area of developing ways of aiding the disadvantaged student. Many times this type of student does not achieve because his teachers do not have proper insight into problems he experiences.

In order to meet the needs of the disadvantaged student taking industrial arts, it is necessary to provide ways to aid and assist the instructor so that he will be aware of the types of problems experienced by the disadvantaged student. This can be accomplished by making it possible for him to attend in-service training sessions dealing with problems of disadvantaged students, visit industry, and visit other industrial arts programs that have proven successful in aiding these students. The value of in-service programs cannot be over-emphasized. "It is commonly agreed among educational authorities that the most efficient method of upgrading the instructional program is through a well-conceived and administered in-service program."[1]

So that teachers may be free during the school day to attend in-service meetings and make visits, a group of six schools should group together and employ one additional industrial arts teacher for each school. This teacher will take classes of the regular staff teacher so that he may attend seminars dealing with the problems of disadvantaged youth, visit industry, etc.

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[1] Opinion expressed by Dr. Clifford Hooker at a Central Office Association Luncheon, Minneapolis, Minnesota, November 12, 1965.

The areas of specialization for the additional teachers should be as follows:

1 teacher	Drafting
1 teacher	Electricity-Electronics
1 teacher	Graphic Arts
1 teacher	Metals
1 teacher	Power Mechanics
1 teacher	Wood

In addition to making it possible for the regular staff teachers to be free of classroom duties for a period of time, the additional teachers will have the following duties:

1. Work with students with emotional and learning problems.
2. Take students on field trips to industry.
3. Help teachers with large and difficult classes.
4. Develop instructional materials; for example, the teacher specializing in electricity-electronics will meet with the regular staff electricity-electronics teachers from all the participating schools to develop instructional materials.

Industrial arts teachers trained in the problems of disadvantaged youth, and teaching a subject area (industrial arts) enjoyed by students in general, can help greatly in solving problems experienced by the disadvantaged student. ■

FRANK R. STECKEL

Associate Professor of Industrial Arts, Appalachian State Teachers College
Boone, North Carolina

The premise has been put forth that unless we implement new methods and techniques of presenting industrial arts curriculum areas to students on all levels, we will fall far short of adequately preparing them to face and accept their place in society upon graduation. I agree!

We who teach industrial arts have long and often loudly proclaimed that we teach students, not classes. Because of the size of our student load, we have been able to do this. Now, however, we have not only larger classes but a great deal more technical information to cover. We can still teach students and not just meet classes, by implementing one of the front-runners of frontier ideas, the *teaching system package*. Most of these systems contain student texts, instructor guides, packaged hardware, and correlated projects.

Teaching systems have well-organized content. They provide students with the opportunity for finding facts, for testing ideas, for experimenting, and for construction of projects. This activity is all based on the time-honored application of learning by doing.

Teaching systems do cost money, but they contribute to efficient teaching methods. It is time administration stopped proselyting instructors' free time and provided adequate teaching equipment materials and supplies. When instructors don't have to spend their time making and repairing equipment, they will have more time to spend on methods and techniques of presenting material to their classes. All too frequently, teachers are so busy getting materials and supplies together that they only *expose* students to learning experiences rather than taking time to teach them.

I believe every student deserves the chance to be challenged to the maximum of his capabilities, at least once before he gets out of school. One of the teaching system packages may be the avenue to this end. Students are not bound to the conventional and mythical average progression, but move ahead as fast as their ability, time, and interest will allow.

Many teachers in industrial arts are having to teach in areas for which they have marginal preparation. A teaching package enables them to do a much better job. When a teacher does a good job of teaching, students stand a better chance of learning; that should be, and is, of prime consideration for most of us.

Another front-runner in new frontiers of teaching is the application of closed circuit TV to the industrial arts classroom. It is especially helpful in lecturing and demonstrating miniature and microscopic subject matter. When using miniature items, such as printed circuit work in electronics, the camera is focused on the demonstration and carried to the student work stations by TV monitors. In its microscopic application, a slide preparation is placed in a microscope and the camera picks up the microscope image and projects it on a TV monitor; thus an item the size of a pin head can be enlarged to the size of the screen of the TV monitor.

Special lectures and items of interest may be recorded on video tape for future or repeated use. The video tape may be used to a definite advantage in giving laboratory examinations. ■

Symposium D

DONALD J. INGRAHAM

Supervisor, Industrial Education, Arlington County Public Schools
Arlington, Virginia

Dr. Ralph Tyler's presentation, as well as the literature forwarded to me prior to the convention, appeared to be an excellent summary of the perplexing quandary in which educators are placed as they cope with the problems of educating all of our people to function intelligently in today's as well as tomorrow's society.

Dr. Tyler's remarks are challenges for us to question, experiment, propose, inaugurate, and develop new ideas, methods, devices, and content to better educate all of our people to become informed, productive, worthwhile citizens of the community in which they live today or tomorrow.

All of us have ideas about how to provide for and to better educate people. I would like to suggest a few. You may have already implemented some of these in your school system.

First, I believe we should take a critical look at instructional staffs to see what they are doing; and what they could do if one condition were to be changed. I suggest staff be employed for twelve months at professional pay. In turn, staff would be free and have time to organize workshops, participate in in-service meetings, develop curriculum and instructional materials, or perhaps just to enjoy the time to sit in small groups and dream, remembering that today's inventions and creations were yesterday's dreams. The working year of the staff and instructional year for students could be staggered. This would permit operating the school plant on a twelve-month schedule. At a national level industrial arts is for the first time just penetrating part of this idea through the few National Defense Education Act Institutes which are scheduled to start in June.

Most schools have employed staff on a pupil-teacher ratio, 21 to 1, or 2100 students to 100 teachers. I suggest the phrase "pupil-teacher ratio" be eliminated from our literature. Pupil-teacher ratio stifles the growth and development of programs that would enrich the total curriculum. The demands for staffing, tied to ratio, are presently planned to meet the needs of only the basic subjects. This is done at the expense of developing experimentation or enrichment classes. It limits the best grouping of students for instruction and does not permit small group instruction. In turn this defeats any method for recognizing and accommodating the individual differences among students.

We need better and more varied instructional materials. These materials must be current and up-to-date and must be compiled for easy comprehension by the students of various abilities. At present it is not profitable for publishing houses to provide these materials as their production needs are controlled by the volume of single editions written for the so-called "masses." Once again twelve months' employment of staff may provide the time to develop a source of these materials.

Looking quickly at plant, can we develop resource centers for each department? These centers would house the films, slides, library, records, mock-up, projectors and all the audiovisual materials a person (either teacher or student) would desire to use in his class. These centers would be furnished in a manner conducive to study, including reading carrels, listening posts, and 8mm closed-loop projectors.

Have we fully developed and used educational television?

Have we explored large group instruction via "tele-lecture"? This is accomplished by a central figure remaining at his work and using a telephone circuit to broadcast to a large group of students. The group, in turn, can communicate to the speaker. For example, our social studies department has arranged, for next fall a "tele-lecture" by Vice President Hubert H. Humphrey, to one of our high school's social studies classes.

Have we fully explored the outdoor laboratory for industrial arts? Can we have building trade students conduct forestry programs or plan, design, and construct buildings to be used by other departments?

Have we explored subcontracting out of school some of our instruction in highly specialized areas?

Have we recognized, planned programs, and made provision in our curriculum for highly creative, academic, retarded, slow learner, potential dropout, or physically handicapped students?

Can we plan and devise methods for independent student study in some of our programs, particularly electronics, drafting, and experimentation and research? This indpendent study would permit a student to progress at his own rate depending upon his ability and concentration.

We have experienced in my county a high degree of success in four programs: education for employment, one period per day; distributive

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education, industrial cooperative training, and vocational office training. In the latter three classes the students enroll in a class where directly related instruction is provided by a coordinator to supplement the occupational training pursued by the students in a local business or industry in the community for a minimum of fifteen hours a week. This training program provides occupational training which financially the local school cannot provide, and permits many students to have a practical training experience prior to college or to becoming permanently employed upon graduation from high school.

I believe there are two obstacles which retard the total secondary educational program and need to be corrected before we can truly try new ideas. First, parents must be educated and some re-educated to the purpose of education and to new programs. Once parents understand these new programs, demands by parents will be made for their children to have these programs and parents will lend moral and financial support.

Secondly, the over-emphasis on the college admission board exams must be reduced. These exams have caused far too much of our instruction to be centered upon only preparing a segment of the student body to regurgitate information to pass an exam. This teaching has impaired and curtailed the total education of the youth. This is evident when we consider out of ten students starting school, only two will complete college. This preparation of students for college has, in too many cases, dictated an "academic" emphasis which has been bought at the expense of the average and below-average achiever, and the creative student.

Have we fully investigated and realized all of the ramifications and potential of the Elementary and Secondary Education Act?

The aforementioned I see as only a few of the many basic and immediate needs that should be either corrected or developed.

Briefly, I would like to restate: Twelve-month employment of staff, elimination of pupil-teacher ratio, updated instructional material, informed parents, redesigned physical plant, subcontract some instruction, provide for independent student study, deemphasize college boards, take advantage of federal legislation. ■

MARVIN J. FELDMAN

Ford Foundation

New York, New York

The need to improve industrial, vocational and technical education is becoming increasingly apparent with the constant decrease in the availability of unskilled jobs, the obsolescence of certain skills, and the disappearance of many occupations at a time when there is an increase in the number of young people who are totally unprepared to meet the job demands of our rapidly advancing technological age which require post-secondary training.

Our schools have been traditionally inclined to favor separate academic and vocational-technical training programs. In addition, the schools have not provided educational programs which meet the needs of a larger number of school children unable to assimilate education subject matter via the traditional teaching methods. The increased input into the schools of a larger number of heterogeneous students is accompanied by the trend toward the belief that universal higher education will soon be a necessity.

We, therefore, can no longer tolerate an education system which separates vocational and academic programs; considers occupational studies inferior to general studies; does not provide the students in the vocational program with the academic training necessary for entry into college; denies the college preparatory student occupational training experiences; or does not introduce students to the concepts of choice between verbal achievement and manipulative performance. We must create in our elementary and secondary school system a coordinated curriculum in which vocational, industrial and general education programs reinforce each other—a system in which high schools would work with state-supported, post-secondary technical institutes or community colleges to develop an articulated pre-occupational 11th- through 14th-grade curriculum leading to entry into th institutes or colleges. A system which is more realistic in meeting the needs of its student population—students who plan to complete four or more years of college; students who plan to enter the two-year institutes or community colleges; students who will terminate their formal education upon completion of the secondary school program; and students who will not complete the secondary school program.

A state's investment in a systematic program of occupational education will return high dividends through increased employment; increased and expanding industry in the state; increased tax revenues from individuals and industry; and a subsequent reduction in relief payments. ■

PROFESSOR DOYLE KEMPER

Head, Industrial Education Department, Southwest Missouri State College
Springfield, Missouri

Anyone who is charged with the responsibility of training teachers to teach in these revolutionary times must at some time feel inadequate, ill-prepared, frustrated, and ready to quit. But to quit is not possible. A choice must be made. Either he goes on teaching the same as he has in the past, or he recognizes that changes in the methods and course content must be made to adequately prepare young teachers for the future in a rapidly changing society. He must move to the frontier "where the wild begins."

Moves of this kind take a great deal of intestinal fortitude, imagination, and soul-searching. Many "frontier ideas" are being proposed and explored. Philosophies, objectives, and methods are being changed in the minds of some for the express purpose of trying to bring into being an approach that will be suitable for a changing world. Which of these will we or should we accept? This is the question that disturbs this teacher educator.

Dr. Ralph Tyler states, "The emphasis now is on the ability to meet new situations, on *how,* not *what,* to learn. Because technological changes are occurring at such a great speed, young people must be trained so that they can quickly adapt themselves to new methods of doing things, new ideas. So far, our teaching has not been focused on this aspect of education." If we accept this as a springboard for our thinking, we are immediately faced with several disturbing questions. Some of the questions that concern me are:

1. Specifically, what are our objectives?
2. What is to be included in the curriculum?
3. What physical facilities are needed to implement the curriculum?
4. Can the kind of curriculum envisioned be offered in our existing schools?

As a teacher educator, I feel the responsibility of encouraging and inspiring young teachers to enter the profession with clear and open minds. They must be aware of the educational revolution in which they are to participate. This must be a challenge they can accept, knowing full well there will be some frontiers to conquer. Therein lies my challenge. First I must teach them how to adapt themselves to a rapidly changing technology; and second, they must know how to teach young people the imperativesness of their being able to change and adapt to an ever-changing world. *What a challenge.*

Involved in all of this are philosophies, objectives, curriculums, methods, and all the rest. A disturbing fact from the past is that philosophies and objectives have too often been written and almost immediately forgotten . . . if not forgotten, certainly not followed. Perhaps they were cast aside by many, many teachers because of the feeling that they were unattainable. It is encouraging to note that those responsible for the American industry study have been so careful about the objectives they are striving to accomplish.

Curriculums must be built or altered to fit the objectives. This is no simple task. It has been suggested that curriculums must be flexible as well as meaningful to the students. Many dropouts occur because students see no reason for the materials being presented. They can make no application to their personal situation. Some are saying that a national curriculum for industrial arts is desirable. Perhaps national guidelines would be a better title.

Methods are extremely important in any teaching situation but more so when attempting to implement frontier ideas. It is gratifying to know that several new approaches are being tried and the results evaluated. Some of these are:

1. The conceptual approach.
2. The research-experimentation approach.
3. The problem-solving approach.

These are sufficient to illustrate the point that there are some frontiersmen in our midst.

In my judgment, much good will come from the work being done as has been the case in other periods of revolution. ■

DR. GEORGE MEHALLIS

Miami-Dade Junior College
Miami, Florida

The deluge of information being continually released by our emerging technological civilization makes it necessary that we re-evaluate our basic knoweldge in terms of "final truths."

In all areas of our changing culture, scientific-technical, economic, and social, it is quite evident that change is all around us. If we prejudge the status of tomorrow's civilization by yesterday's yardstick, today's best educational judgment could turn into tomorrow's holocaust.

We know the nature of *work* will change:

- There will be little need for people with no skills and much less need for those with limited and partially developed skills. Machines will have been developed to do most of this work faster, more accurately, more efficiently, and more dependably.
- There will be an increasing need for highly-skilled people in the scientific-technical fields. Formal education will be a requirement for all work of this type. There will be too much to know. People must be subjected to an education that they, until now, have been able to reject. Thus, our attitude must change to a more technically-oriented education.
- Work, as we know it, could become less meaningful. We must then find a new concept of meaningfulness and usefulness. It is quite plausable that our civilization of the future will have half of its working population participating in this new concept of purposefulness. For example, keeping our highways and cities clean with an army of sanitation workers; a huge, trained police force to make our cities truly safe; a huge conservation corps to beautify our cities and countryside,

prevent soil erosion and build dams. All of this is possible, and even more. The routine work will be done by machines while the creative, the scientific, the planning, the manufacturing, the artistic, the thinking, is done by the people who can do these things the best. Work could then, perhaps, finally become the measure of men, and effectiveness the measure of ideas.

- Jobs will have a shorter life span. There will be less security because the still-advancing technology will make many occupations obsolete soon after they are created, thus requiring training in a cluster of occupations.

We must alter our attitude towards *change*. Teachers, and our general adult population who have been brought up to cherish the stable, must take children who have been brought up the same way, and teach them to live in a changing world. People will survive in an age of change only as successfully as they become familiar with change; feel comfortable with it, understand it, master and control it. This is *how* we will learn.

■

CHARLES B. NEWTON

Matthew Gage Junior High School
Riverside, California

Perhaps many of you are—as I am—a bit confused, somewhat frustrated, but downright excited about the challenges of the new frontier ideas. We are often confused when we hear such remarks as, "Where will you stand after ten years, when half of what you now know becomes obsolete," frustrated because the demands of technology often appear greater than our capabilities; but ever excited by the opportunities and challenges placed before us by the technological advances.

Briefly, I would like for you to think with me on four ideas for implementing new frontier ideas. Let's begin by examining the role of public relations. We are our own best public relations department; we have full responsibility for the community's attitude toward us, our teaching, and our field of endeavor. Proper methods and channels to sound public relations are as limitless as the ideas of the new frontier. In our attitude and thinking may we be ever aware that the schools are built by the people, for the people.

Perhaps no other form of implementation can be of greater value than that of applying the principle of group dynamics. How many industrial arts teachers do you know who are active in a program of curriculum study and development? Most of us operate an efficient and well-organized industrial arts laboratory of some type. Yet, planning and cooperation outside the four walls of our "ivory towers" remain a "no-go." Suppose we choose to continue planning our curriculum and programs to satisfy our desires and findings. Some of Dr. Tyler's new "institutions" may be necessary to meet the new frontier ideas. We are living in an era which demands that we integrate our planning and thinking. Working together we will meet the challenges of the new frontier.

Once we have our curriculum guides under way, we must examine innovations made available by technology. Too often we do not use the ideas we are attempting to teach our students. We must take a close look at every new idea, method, and material, and select for more effective teaching. Obviously, advancing technology will make this a never-ending process.

And what about this effective teaching? Dr. Tyler asked that we begin with the concrete and proceed to the abstract. We must do this by concentrating on how to learn, not what to learn. The problem-solving approach is not entirely new to industrial arts.

Industrial arts programs based on sound public relations, applied principles of group dynamics, selection of proper innovations, and effective teaching, can and will meet the challenges of the new frontiers. ■

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ETHAN A. T. SVENDSEN
Indiana State University
Terre Haute, Indiana

I refer you to "This We Believe" (AIAA's recently published credo), first paragraph:

> "Industrial Arts should be a part of the *learning experience of all students* at all levels of grade and ability, in order that they may understand and learn to control their industrial-technological environment."

Note two major ideas: (a) all students at all levels; (b) understand and learn to control. These two ideas, taken together, mandate a liberalizing, general education in the curriculum area of industry and its supporting technology. All American youth need a properly conceived industrial arts education to augment ability to discharge the great and common vocation of citizenship in an industrialized democracy. This is the most important responsibility that industrial arts has. Frontier curriculum workers at the secondary level must give a place of dominance to this requirement. The curriculum fragmentation of the past has failed here. Excessive and premature specialization will also fail even though it occurs in modernized categories of subject matter.

Pertinent and supporting ideas based upon Dr. Ralph Tyler's remarks:

A. We all understand and accept Tyler's emphasizing the all-pervasive and ubiquitous influence of industrial activity upon the national life and upon the individual (social, political, economic).

B. The above statement reinforces Tyler's declaration that we need intelligent decision-making in the several areas of citizen participation. This requires understanding and insight.

An adequate industrial arts education relieves ignorance and thus leaves the citizen more free to make decisions based upon understanding. This is true when a citizen acts as a voter; it is also true when he counts for one among millions of like minds who collectively exert the unrelenting thrust of public opinion.

Reduction of industrial ignorance is valuable just for the sake of making the citizen intelligently aware of what controls and shapes his destiny even if he can't do anything about it.

C. Tyler declares education to be more than fixed habit and established fact. We gain flexibility by learning how to learn.

Acquiring the capability of independently continuing one's learning combats obsolescence. Thus a drastic change in methodology of teaching and learning is just as important as an expanded and modernized subject matter. No longer must we depend exclusively upon a stimulus-response learning psychology. The motivation for learning arises under the necessity of meaningful difficulties that demand solutions. To delineate problems, to acquire data that holds promise of solution, to experience some success and thus develop some degree of confidence that solutions are possible—these must be the signal characteristics of teacher guidance and direction.

All American youth must experience industry in the wholeness of its organization from the very beginning of their educational contacts with industry. The student must see all of his industrial arts experiences within, and as a part of, the framework of *a simulated industrial enterprise*. In successive semesters, each student adds to the depth and sophistication of his industrial understanding; additional particulars are learned as his interest, inclination, and ability dictate. The important advantage is that each semester (even the first one) presents a whole picture (even if lacking in detail at the outset).

This curriculum organization avoids the myopic view that current fragmentation presents to the student, especially if he has time for but one or two courses. This organization can provide room for all levels of student grade and ability; it can accept boys and girls as its "employees," it provides ample opportunities for study and development of entrepreneurial, management skills, and it purveys its technical and other content as the natural response to real problems that have been ferreted out by students upon whom the responsibility for the successful operation of the enterprise has been placed. ■

Symposium E

RAYMOND H. LARSON

St. Cloud State College

St. Cloud, Minnesota

The federal government is in education in a big way. To say the government exercises considerable control over education is an over-simplification. The federal government has entered into educational policy making, and is bringing about significant shifts in the sources of power affecting the control and support of schools, colleges, and universities. If the interagency conflict among the 20 or so separate, uncoordinated, autonomous Washington agencies had not existed, making it difficult to clearly establish lines of authority, we would be much further along in the transfer of local control to federal control. Sizer has made the observation, "We have been dealt a new set of cards, and we must learn how to play them."

The generalizing of vocational trade training to encompass good industrial arts programs certainly dealt new cards to both vocational trade and industrial arts interests. Perhaps the challenge here is for the two areas to project into the future in a more concerted fashion. The inclusion of industrial arts under Title XI has placed in the hands of those approving proposals the direction industrial arts will take in the future.

A power structure has been superimposed over our educational system which by its nature will continue to seek added status and increased power. Old lines of communication and influence are breaking down or are broken altogether. New ones are opening and others are being erected. Tradition is being cast aside. The innovator is in the driver's seat. New federal programs place a high premium on the new and register disdain for the present ongoing programs.

The entrance of the federal government into educational policy making and the advances of technology are forcing change. No longer can we await death and retirement. All areas of education are crying out for leadership, leadership daring enough to innovate, to cast aside the traditional, and set a course designed to eradicate ignorance, enhance adaptability, and develop our human resources.

A great deal more needs to be done in developing leadership which knows the cards in the deck being played with today and how to play each of the cards most effectively. We need to develop individuals in greater numbers who are willing to pay the price of leadership.

I propose the development of the leadership conference idea used so effectively by Ralph Wenrich, University of Michigan. This institution should be refined, expanded, and specifically adapted to industrial arts personnel. We need to educate leaders who can develop, structure and administer federal programs of great dissimilarity; leaders capable of operating in the developing power structure; and leaders capable of presenting a good image for industrial arts. ■

CARL HOFMAN, JR.

Modesto Junior College
Modesto, California

Man's use of mind is dependent upon his ability to develop and use tools, instruments, or technological processes. It was this tool-using technology that enabled man to extend his activities and environment. Through the language tool, man has broadened his horizon, amplified his senses, increased his powers of reflection, and recorded his achievements and failures. With technological and scientific advances, man has produced many conveniences. This has in turn created other problems; i.e., the automobile—a convenient device for transportation and leisure activities, etc., but also an agent for crippling and death.

Mathematicians predicted that the computer would cause despair and ruin, and forecast wholesale unemployment because automation would abolish jobs on an unprecedented scale. Despite predictions, the number of persons gainfully employed increased from 59 million in 1949 to 63 million in 1955. Since 1955 the number of people with jobs has increased to 71 million. In addition, 4 million persons now hold second jobs. The average hourly income in 1949 was $1.80. The average hourly rate now is $2.25 plus fringe benefits. Fear of technological advance and automation are based on (1) the assumption that there is a fixed amount of goods for buyers, therefore any new method which produces more goods will result in the hiring of fewer people; (2) human beings will be made obsolete by machines that can out-perform them; (3) there will be fewer job opportunities for those with obsolete skills; (4) there will be jobs only for highly skilled workers.

Automation for the most part causes displacement. Statistics show that the total number of unemployed is smaller today. The primary effect of automation is to make it possible to do more things, earn larger incomes, and have more leisure time. Our technological advances have changed the nature of work. Many industries retain their workers, but simply retrain them to do different jobs. Granted, there will be lulls, plateaus, and even declines in employment. Advances in technology have created 10 million job positions in the past decade. Approximately 9 million people change jobs each year, some of whom require retraining. At General Motors Corporation, the average employee changes jobs six times in ten years.

A glance at work areas indicates there is work that ought to be done and which is not being done. There are many opportunities in primary and secondary teaching—teachers in some areas are overloaded. As another example, many of our streets, highways, and cities need repair, clean-up, and junk removal.

An individual, to be employable, must be literate as well as skilled. These skill levels may vary over a wide range. Only a few years ago we were led to believe that the acquisition of a skill would be sufficient for a lifetime of work. With our changing technology, this simply will not suffice. Our society must face the reality that training, learning, and education must also be a changing thing.

To meet these changing manpower needs of our modern society, many new schools, programs, and institutions have been developed. These new training challenges are being met by federal, state, and community institutions. Industry and private endowments have contributed to a great extent with financial assistance, and many individuals have contributed intellectually. If we agree that society is changing with increased rapidity, then how can our educational and training facilities meet the obsolescence of skilled technological and scientific manpower?

1. We must participate actively and continually in the educational processes.
2. Our society must come to realistic grips with motivation. We must reinforce the channels that drive us to learn. We must stimulate the desire for accomplishment and professional excellence.
3. We need to develop new and better methods of teaching.
4. We need new and faster methods of storing and retrieving knowledge.
5. We urgently need better teaching aids and better methods of imparting knowledge to the student and improving the teacher-student relationship.

I would like to be able to solve all of these problematic areas. Since this is not attainable, I will limit myself to informing you briefly of a number of projects that are currently being done in the Modesto area.

1. Project "Search." In the spring of 1964 our county schools office was authorized to participate in a five-year follow-up study of the 1964 high school graduates, involving eight high schools. The mechanics of this project were accomplished through questionnaires and personal interviews. The purposes of the study were:
   a. Vocational aspiration and actual employment that did not require a college degree.

   b. Investigation of the skills and knowledge requirements of job opportunities.
   c. The relationship of school curricula to job skills.
   d. The preparation of a resource guide.
   e. Additional information and activities as indicated.

Results:

   a. Of the 1850 graduates, 93 per cent responded to the first questionnaire and 73 per cent to the second. 51 per cent of the graduates made personal comments.
   b. 363 graduates secured full-time employment and earned an average of $74.00 a week.
   c. 72 per cent continued with their plans made in high school, 27 per cent made changes.
   d. The high school courses chosen as the most valuable were English, math, science, and business.
   e. Areas that should have been stressed more were writing essays and term papers, more mathematics, more homework, and the development of better study habits.

Plans are under way for the study of junior college dropouts in the area.

2. Work experience programs in the Modesto City Schools:
   a. Exploratory—no pay, school credit: jobs such as teacher aides, librarians, etc.
   b. General—students are paid, may receive school credit, do a large variety of jobs. The emphasis is to familiarize themselves with the world of work.
   c. Vocational—must be recommended by a vocational area; paid by the employer—for example, auto mechanic, printers, etc.
3. In our area we are engaged in a community effort to study the total occupational education problem. This is a cooperative effect where the various high schools, government agencies, counselors, members of industry, will aid our educational planners in the development of a total occupational and industrial arts education program.
4. Professional organizations: We have our local industrial education association which enjoys a high percentage of active members. They are engaged in special workshops, cooperative planning efforts. A variety of experts are invited to speak. Many of our teachers secure jobs in industry, thereby remain current in the world of work. We have established good articulation between elementary, high school, and junior college. We do public relations through craftsmen's fair projects, displays, distribution of brochures of our school programs, and keeping the public informed through newspaper and radio media.

We are not solving all of our problems, but we are certainly putting our best effort toward plausible solutions. ■

LOUIS J. BAZZETTA

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Occupations, Information and Choice

"The family function of inducting the child in the nature of what is right and wrong, and what his occupation will be is no longer a simple one." This statement by Dr. Ralph Tyler has definite implications for all of us.

We all subscribe to the fact that an aim of industrial arts education is to provide information about, and exploratory experience in, various industries so that the student may develop an insight into various occupations. How much are we doing this? Opportunities must be provided that will enable the student to become aware of his abilities and shortcomings and help him make a wise occupational choice.

The student's experience and information is narrow and limited. It is *our* responsibility to widen and expand it; this responsibility does not belong only to the counselors or parents. While some advances have been made in this area, a great deal more remains to be accomplished, especially on a national basis.

Occupational orientation should be a part of all industrial arts instructional programs. This orientation should include job description, educational training and requirements, physical requirements, working conditions, wages or salaries, opportunities for initial employment and advancement, job satisfaction, and sources of education and training. Instructors need to know the techniques for utilizing this information to inform and guide their pupils in making a wise occupational choice. Occupational information is a "must" in a society in which new jobs are constantly emerging and others disappearing.

Innovations

Everyone concerned with education should seek new ideas and solutions to problems in curriculum and methods. Dr. Tyler pointed out that one way of attacking the new tasks facing education is to develop new institutions to deal with the many new problems. In the term "new institutions" he includes whatever the arrangements are for changing the curriculum.

Since Sputnik, national funds have been provided for the improvement of instruction in some areas of the curriculum. Last year industrial arts was included under the NDEA to provide in-service training for teachers and organize teaching materials that will result in a better curriculum and improved teaching methods.

Within recent years, there has been an occasional demand by some educators for a national curriculum. The wisdom of such a step is debatable, but there is strong evidence to support the notion that national guides are needed. The National Science Foundation and the Mathematics Foundation have made excellent strides in this direction and so can industrial arts education.

Now what can we do to encourage innovations in curriculum and methods? This is a difficult proposition because people do not accept change easily. Some teachers resist change because they are committed to the present program; trained or educated to teach in a certain way and do not desire to change; complacent with what they are doing and change would require additional work. There are many other reasons. However, if progress is desired, changes must be made.

As a coordinator I believe that the following suggestions would help:

1. Every teacher should be encouraged to try out new ideas and be involved in curriculum planning.
2. Innovations should be attempted only after much consideration and planning.
3. Moral and financial support should be given.
4. After the innovation has been given a fair try, results must be evaluated. Continue with the good and discard the poor.
5. Encourage proposals for pilot programs that will qualify under present vocational and educational acts.
6. Encourage teachers to attend institutes, conferences, and workshops.

Finally, it must be realized that a school system does not change its program overnight. It moves only after careful consideration and planning has been given to many details. ■

VIRGIL L. CARTER

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Augusta, Kansas

Technology places demands on education and also offers new opportunities for youth. Would industrial arts education be more appealing than English or some of the other academic subjects because of these factors? (1) Industrial arts offers occupational variety to our young people; (2) it offers a challenge to improve present techniques and devices; (3) it provides satisfaction and craftsmanship to every potential learner.

Consider the occupational variety. For the future workers of industry—either the students who leave school early or the ones who continue their formal education—whether they are of high or low economic status—and whether they are of low scholastic ability or honor students, there is a definite contribution for all so they can learn to live in today's technological culture. It gives each student a chance to perform to his greatest level without academic pressure. For future professionals—teachers, instructional staff or supervisors in industry—it requires the very highest level of competence, creativeness and ingenuity, and the ability to get along with and enjoy working with people. A study of such principles as application of mechanism, influence of automation, and mass production are a must for the future leaders in industry.

What challenges are made to improve present techniques and devices? For the future scientist or engineer, industrial arts education provides a basic knowledge of the profession and enables him to solve technical problems relative to the particular involvement. For the future craftsman or technician, industrial arts provides opportunity for developing skills and obtaining technical information.

Industrial arts education provides personal satisfaction and craftsmanship to every potential learner. These changes are wholesome and they develop an interest in our man-made world. It provides opportunities for learners to discover and develop their own talents and abilities. They will be able to make a self-evaluation of attitudes in their own lives in health and recreation, economic values, creative thinking, and character improvement. This should make for wise application of leisure time in our environment.

Further evidence of our technological world is emphasized by the steady decrease in jobs for the untrained and unskilled workers. Men have been replaced by machines in the production of material goods—food, clothing, and shelter. Agriculture demonstrates this fact very vividly in the Kansas wheatfields, for example. One giant combine can harvest more wheat in a day than 100 men can in weeks. For those of you who know Kansas weather, you know a wheat crop will not wait—even for one week. Time is valuable, either in an instance controlled by the forces of weather, or the space race to decide who lands the first man on the moon. Through industrial arts education we can and must provide skilled workers for these modern advances in our technological world.

Machines, however, have not been able to replace parents. Children still need parental love and guidance in order to be able to function physically and emotionally in this fast-moving world of ours. Fifty years ago, people seldom traveled outside a 50- to 100-mile radius of their homes. Today, fast-moving jets travel 2,000 miles in a few hours—and this is the normal, expected mode of travel! The role of the family—properly executed—keeps the child on the side of stability rather than instability. This definitely is one of our educational responsibilities.

It is also necessary that we be educated in present-day leisure activities. High speed, outboard motor boats for example, require not only an extensive degree of training or knowledge in the operation, maintenance, and repair of the equipment itself, but also knowledge of the particular water inlet—depth and location of main channel, safety devices, emergency procedures, and so forth. Simply knowing how to start and stop a machine is not all that is necessary. Here we can apply the old adage, "A little learning is a dangerous thing." Leisure activities, as well as the production of our material goods, have been affected by the advances of technology.

Changes in technology are occurring at such a great speed that our young people in the future will probably change occupations at least three times in their lifetimes in order to keep up with the pace. Education must teach how to adapt to these rapid changes in automation or those who are not able to vary their abilities will be left by the wayside. Industrial arts education offers enough general variety that a person trained in this field should be able to adapt quickly or convert to another related field without a great deal of retraining and loss of time. In the past, education has been based on rather concrete facts. The education of tomorrow will have ideas and facts which are obsolete almost as quickly as they are verified because of the change to automation. Knowing the whys and hows instead of the whats will successfully bridge the gap between the inexperienced, untrained worker, and the worker already trained.

On the issue of developing new institutions, the new G.I. Bill just passed, giving veterans who have served since 1955 the opportunity of obtaining an education, will foster many of the new area vocational-technical schools. Young men who get in on the ground floor of this new training program will be able to choose the best positions available.

The techniques used in the Rochester Institute of Technology are good, because they relate the education to the job involved. Many of our required subjects in education do not have any relationship to later life or employment, and therefore become meaningless and result in many dropouts. The "busy work" type of thing, such as memorizing a piece of poetry in required literature, becomes meaningless to one who does not already enjoy and understand poetry. Thus, to require everyone to take this subject is discouraging, and no practical value can be envisioned.

The ability to reorganize and make a program flexible in order to meet the needs of particular groups for particular jobs will be the greatest single asset an individual teacher can offer his country or his community in our fast-changing technological world of the future. Geographic location will play a part in the importance of a particular program. What would be needed in New York would not necessarily be needed in Kansas, and vice versa. As times change, so also men must change, or be left out of what promises to be an exciting and thrilling succession of tomorrows!

■

DICK WARNER

University of New Mexico

Albuquerque, New Mexico

For many years the lack of education among parents with regard to their offspring has been discussed. Now Dr. Tyler reminds us that, "In a society such as ours, where at least 65 per cent of our children are in homes where the adults haven't been where the children are going, parents no longer know what to teach their children." To my knowledge there are few programs responding to this challenge which have met with universal acceptance by parents. Since parents share the responsibility of bringing up their children to fit into society, it is imperative that parents be educated properly so they may help educate their children properly. In addition, parents have an obligation to society which must not be ignored in terms of their children's future.

There is no reason to believe that parents would voluntarily stampede to any classroom available to them for the purpose of enrolling in special courses to acquire knowledge which would be instrumental in the teaching of their children. The average American fails to exert much genuine effort along these lines until it is too late; too late to provide children with the right kind of direction, even if the proper direction was previously known.

Action to be taken. With these facts before us it becomes evident that drastic measures are in order. Why not make it a requirement that parents or guardians of children between the ages of 5 to 16 years must enroll in special courses? These courses would be directed toward the end that parents must accept the responsibility for helping to educate their children, in conjunction with the schools, for society now, and in the future. These courses could be conducted by a live teacher or through television. Periodic television programs could be channeled into the home and/or into schools where persons without these facilities could gather. Without extensive research it is not known how long or how many programs would be necessary. A testing program may be used to validate a person's attendance at a class meeting, or meetings.

Rewards. Naturally a positive approach would be essential for the success of the program. People must be made to feel they want to participate in a program which will be beneficial to their children's future and to society. The rewards must be more than psychological, however. There must be something tangible; something concrete. Perhaps it would take the form of, "No participation—No income tax deduction for children on the tax return." For those who are not paying income taxes, as such, their subsistence would be cut.

Industrial education's part. Persons associated with industrial arts education would be among the primary curriculum and course planners since this group of people is as close or closer to the new technology than others in the educational field.

Problems. There would be numerous problems for such an endeavor. To mention a few: finances, enforcement, special teachers, special programs, parents' apathy, and evaluation of immediate success for the program. Then there are problems dealing with commercial television which would be momentous. ■

Symposium F

L. H. BENGTSON

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Frontiers of industrial arts education as explained by Dr. Ralph W. Tyler are to the point and very timely. The teachers of industrial arts have a challenge, to meet the modern demands of education for youth in this rapidly changing culture brought about by new technological developments.

To preface these remarks it seems desirable to quote from a publication of the United States Department of Labor, *From School to Work,* which states:

> The job of educating youth for the decade ahead will be made more difficult by their sheer numbers. Young people reaching 18 years of age are expected to increase especially fast—from 2.6 million in 1960 to 3.8 million in 1965, up nearly 50 per cent in only 5 years. The 1965 rate will continue through 1970.

Of the 25 million young people who enter the labor force in the 1960's, which is 40 per cent more than entered in the 1950's, 70 per cent will have at least a high school education and 26 per cent will have had some college work. This is a considerable increase in the amount of education over those of the decade before. There will be some 7.5 million who did not finish high school and 2.5 million who did not complete the eighth grade.

In a national survey by the U. S. Department of Labor it was learned that nearly all high school graduates, both boys and girls, had completed at least one occupational training course, either commercial or industrial. Nearly two-thirds of the dropout boys and girls had also completed these courses. Three-fifths of all the boy graduates had completed at least four industrial arts courses where only one-fifth of the boy dropouts had completed this many.

The Oklahoma State Employment Service reported that one-half of the dropouts quit school at the end of the tenth grade and 35 per cent at the end of the eleventh grade. More than 70 per cent of these students had not participated in any club activities or school sports. At the time of the Oklahoma survey, 61 per cent of the dropouts were unemployed which is a much greater figure than the national results reveal. Ninety-six per cent stated that not having a high school education would affect their employment in the future and 92 per cent said that they would finish high school if given another chance. When offered the chance to finish under the Manpower Development and Training Act, many were not interested, and of those who did enroll, one-third had withdrawn within two months.

Some of the reasons given for leaving school were: lack of interest, lack of counseling, retarded in grade level, no sense of belonging, marriage, lack of money, and unemployment.

Three types of industrial programs are provided by the modern high schools, (1) technical training, (2) vocational training, and (3) industrial arts.

The new technical training program will accommodate only students from the upper intellectual level who choose to be technicians.

The vocational programs are designed to give the high school graduates who choose this type of education, a marketable skill which will enable them to find their places in industrial society.

Industrial arts is the type of industrial program that may be available to students in the high school or even in the junior high school. Industrial arts can meet some of the requirements of the individual by providing a broad preparation for becoming employable. He will have learned about industry, its organization, its methods of manufacturing, its tools and the materials it uses, in addition to the working conditions to which he must become accustomed.

He should have enough general knowledge so that he can easily adapt himself to a specific job. He should be able to make a true evaluation of products which would enable him to be a wise consumer. His shop experiences should furnish training that would assist him in cooperative efforts required in industry. Industrial safety practices should be recognized. Industrial arts should assist the student in making his choice of occupation by furnishing background information and some degree of skill.

These new demands on the high school graduate reflect the need for a reevaluation of, and modification of, our industrial arts program. All of our teachers from the junior high schools through the colleges and universities must keep informed about these changes in order to properly instruct the pupils. New demands upon the teachers are being made every day.

The crowded curriculum will not provide a place for an outdated and inefficient program in any area of instruction. The curriculum should be made to fit the needs of the students instead of the pupils being required to meet the rigid standards of an outdated program of study. ■

DURY A. FOX

Renton School District

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Someone has said "The ultimate goal of the educational system is to shift to the individual the burden of pursuing his own education." Industrial arts instructional methods of the future must shift the responsibility for learning from the instructor to the student. If education is going to provide the student with the capabilities necessary for him to learn new things on his own, or to react satisfactorily to rapid change, or to be able to make wise choices, the burden of responsibility must be on his shoulders.

The prodigious growth in knowledge in recent years makes it impossible for us to teach anyone everything he should know. Many jobs needing skilled workers today did not exist a few years ago, and there is no accurate measure for predicting the specific type of preparation needed for jobs that will exist in the future. A large percentage of products on the market today are made from materials that were nonexistent prior to World War II.

A spoon-fed type of education, restricted to isolated specifics, presented in a routine, repetitious manner will not prepare a student for his future work, nor will it likely stimulate him to assume responsibility for learning. There seems to be evidence that learning takes place only to the degree that the learner assumes responsibility for it. The unanswered question seems to be, how do we get a student to assume responsibility for his own learning? This is where the teacher enters the picture. It is through the teacher's ability to use teaching methods which will bring about the desired results.

The design/problem-solving technique which can be used by teachers in all industrial arts classes offers one of the best approaches for transferring the responsibility for learning to the student. Drawing and designing seem to be particularly well adapted to the problem-solving method. Suppose, for instance, an instructor in beginning furniture drawing decided to use the design approach rather than the old method of assigning students a series of plates to draw joints, leading up to pieces of furniture, using a clearly illustrated and dimensioned textbook. He might proceed somewhat as follows:

1. State the problem (which may be a simple device to hold books)
2. Define the nature of the problem
3. Ask questions such as where, how, how large, type of materials to be used, etc.
4. Require students to prepare rough sketches of some possible solutions to the problem
5. Experiment, eliminate and select
6. Prepare a working sketch of the best solution
7. Construct a model
8. Evaluate.

The design approach puts the responsibility for learning where it belongs—on the individual student. It puts emphasis on the growth and development of the individual, and in the direction which that growth and development should take. It makes the student responsible for finding a better way. Teacher-planned projects are not consistent with the design approach to problem solving. Problem solving gives the teacher a new image. He no longer does all the planning, designing, etc. He becomes an adviser, a consultant, and a resource person. A student's thinking is no longer confined to a specific lesson or set of techniques.

Industrial arts students may also be challenged by being assigned to solve a problem which involves a degree of research, investigation, experimentation, and testing. The construction of a metal project, for instance, which not only must have good design but also contain such characteristics as lightness, strength, corrosion resistance, and fracture resistance, would be an example. The same procedure steps as mentioned earlier in the design approach may apply, such as a search for a better solution, the application of clear thinking, imagining, creating, selecting, and constructing, especially if the teacher has done a thorough job of preparing the student for the task. These are but a few examples of methods in teaching which will help shift the responsibility for learning from the teacher to the student. The possibilities seem inexhaustible.

Very closely allied with the student's responsibility for learning is the importance of developing within the student the quality of versatility—*occupational versatility.* Any young person who hopes to earn a living and cope with life in the future must prepare himself with this quality of versatility, the ability to meet new situations as they occur in our rapidly changing technological age.

People must be able to train quickly for new types of jobs and they must have the capability of adapting themselves to new methods and accepting these changes with equanimity.

How can the industrial arts programs throughout the country make a contribution to this quality of occupational versatility?

The industrial arts curriculum should be updated to relate to modern technology. Retain our present organization and enrich existing areas such as electricity-electronics, power mechanics, drawing and design, graphic arts, woods and metals. Encourage all students to take industrial arts courses in at least two or more areas rather than to take successive years in one area which has been the practice. Diversify the offerings so they will appeal to students of all abilities. Include in the program emphasis on experimentation, research, problem solving, and design. Encourage good design at all times in all areas. Make certain that students have the opportunity, and are encouraged to apply knowledge they have learned elsewhere in the school program.

We hear much these days about industrial arts courses including the application of math and science. If properly taught, industrial arts not only includes the application of math and science but also the application of English (written and oral), social science, political science, economics, technology, physiology, sociology, and now since we are encouraging and getting girls in our programs, it is the application of family living.

Conventions, conferences, workshops and the like serve a very important function, and no doubt contribute greatly to the over-all improvement of industrial arts programs throughout the country, but after the talk and palaver is over the success of industrial arts depends solely upon the competency of the teachers who teach the subject. How students perform, what they get out of the program, how well they are prepared to meet the demands of the rapidly changing world of tomorrow, and to a great extent, the nature of their attitudes toward technology, depend upon the quality of instruction they receive today.

By and large industrial arts teachers are competent, and the majority want to improve their competency. However, if this is to be accomplished, something more than lip service must be given to programs which will improve the present level of industrial arts teaching. It would appear that some basic provisions for teacher upgrading could be made available to all teachers and involvement be a requirement. One such possibility is establishing in-service training programs in school districts employing 12 or more industrial arts teachers. The importance of continuous education for industrial arts teachers is dramatized by the fact that the professional skills and knowledge of technicians and engineers who fail to take on-the-job training become obsolete every ten years or less.

Teacher education institutions, because of the vital nature of their influence on the education of all young people, should lead in keeping abreast with industry and technological advancements.

Recent availability of foundation and federal money for industrial arts research is encouraging. However, the results of research now in progress and research not yet underway should, upon completion, be implemented and made available for use in the classroom.

And finally, greater efforts should be made to provide for rank-and-file teacher participation at conferences such as this. All but a fortunate few must content themselves with a second-hand report from their supervisors—a bitter pill indeed. ■

ROBERT C. DeVOE

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In the advancement of our technological era there are certain aspects of which we need be cognizant. We are told by those in authority that many of our children will in the future have two or three careers, retraining for a new job as the old ones become obsolete. Many skilled workers will be forced to retrain as computer-controlled machine tools take over their tasks or because new products and new plants will be created. Not only are the jobs going to be different from today's but less time will be spent on the job, resulting in greater time away from the job.

Expanding technology will require an increase in the number of skilled employees while the percentage of unskilled is expected to drop; the number of maintenance and repair services will increase, and maintenance men must have a basic background of many skills.

We are told that life-long education will be more widely available in the future. In addition to more colleges, occupational training schools, and centers for instruction in recreation activities, there will be more institutes attached to industry, business and government, catering to all individuals.

With the explosion of knowledge today, still industry asks us only to stress basic learnings such as the ability to think, to communicate and to read, to gain a basic knowledge of arithmetic and laws of physics, to possess a positive attitude, and to listen effectively. What industry demands might be termed indispensable knowledge to someone who enters the occupational world.

All the research findings and inventions of science today are dependent upon many people of mechanical competence who possess certain factual knowledge and skills. With these facets in mind, we realize there is a certain core of knowledge that is a part of our common education and that is necessary for everyday living; hence, the teaching of certain facts and skills. As time passes, a certain skill may become of less importance than it was at one time, and even be discarded; but still there is no substitute for prevailing skills or facts to provide a fundamental knowledge from which to imagine, create or think abstractly.

We must, therefore, incorporate within our curricula not only a solid base of certain facts and skills, but the opportunity for problem-solving and abstract thinking. In other words, the student in industrial arts must be taught that there is something more than the acquisition of facts and skills; he must also be able to *apply* his knowledge and skills, which is to abstract from those basic concepts. It is easy to learn the fundamental skills, but it is difficult to define a problem, and to recognize the skills and methods of solution.

Let us say a particular need provokes a design problem, and this is the concept where industrial arts may very well make a large contribution to general education. For example, one is going to design a patio cover for his home. There are certain skills required to put it together; but, depending upon the materials available and the processes required to assemble the material, the basic skills of nailing, sawing, drilling and fitting will change. But what will not change is the way these skills will be put together or synthesized—with a design, a method, and a solution becoming the result.

If the time comes when wood is not the common material to be used and the student, because he has had a general basic teaching, will be able to solve and design building problem with a new material, new tools and new techniques, then he will be a better adjusted person.

Therefore, what must I teach? In addition to the objectives of general education and industrial arts, we especially approve of the suggestions made by Dr. John L. Feirer, in an editorial in the magazine *Industrial Arts and Vocational Education.* Among other criteria, he states that there should be emphasis on design, emphasis on technical vocabulary, the use of a basic textbook, emphasis on fellow-worker relationships, better application of science and mathematics; and that the curriculum should be geared to the technology of the era with added enrichment in each area.

As a concrete example of what might be considered an acceptable approach to this, there is in a particular school district an advanced woodworking class engaged in the actual planning, construction and marketing of some small houses usable as tool or play houses. These concrete experiences are then followed by such abstract concepts as home purchasing, owning and maintenance. This may or may not have a vocational aspect for a student; but, due to its nature, such a choice of project will have definite value to all students.

This type of project and teaching procedure is not new, but it is an attempt to keep the curriculum geared to the technology of the era through the use of modern materials and current building techniques, providing problems to solve, and last, but not least, developing skills with which to think abstractly and from which to draw conclusions.

The question then follows: As a follow-up objective will these students, in the future, be better able to think abstractly from these experiences; will they be able to synthesize these skills, and develop a design in other situations; will they be better able to solve problems in another kind of job which requires new skills, and thus be better adjusted persons? To have a reasonable assurance that the follow-up objective is being met, we will have to wait until after graduation when the students will have had an opportunity to use their school training.

The idea of teaching abstract skills after a fundamental base is laid is not particularly new, nor are concrete experiences before abstract concepts new. However, the development, on the part of the student, of abstraction from a broad foundation of skills is perhaps a frontier idea.

In summary, we believe that the training in abstract thinking is a practical and realistic enrichment of the curriculum and that it should be used in all subject areas in industrial arts. Also, with some reorganization, courage, and extra work, teachers *can* implement new ideas in industrial arts. What we must remember is that facts and skills are means to an end, and not ends in themselves. Education is what remains when many of the facts and some of the skills have been forgotten. ■

Symposium G

WILLIAM R. ERWIN, JR.

Colorado State College
Greeley, Colorado

The great innovations in the curriculum today have been for the purpose of making the program as meaningful as possible. Technology needs have changed so fast in the last few years that it has been difficult for education to keep pace with it. Therefore, the "missile race" and the "industrial technology race" have developed into an "intelligence race," and further into a "new programs race."

Present day schools are evaluated by some patrons and also some educators according to the number of programs, the newness of the programs, or the number of gadgets used to teach them. All such programs or gadgets are not as new or as great an innovation as their copyright date might indicate. Many represent a more practical application of very old concepts—not necessarily out-dated ones. If the new programs were more carefully presented as new approaches to time-honored objectives, they might be much more readily accepted. Even though many new terms are used they actually do not represent many new concepts.

The change of content does not seem to be as important as the change in method. We are obviously in an age of receptiveness toward new approaches and new content. The change in method should be based primarily on more effective ways of motivating students. Evaluation of the "new" or "modern" programs should be based on the interest and enthusiasm they create for sincerely seeking answers, rather than on the newness of the content being presented.

Curriculum content should change as goals change. If our methods of teaching are those that motivate students to see that their goals are dependent upon depth and breadth of understanding, new content can be absorbed into the curriculum without drastic revolutions and innovations. Science education involves the acquisition of basic understandings in science and the development of skills of inquiry. Industrial arts also can and does involve problem solving. Genuine appreciation for skills, beauty, quality, efficiency and time, will send the student on his way and capture his interest in observing, experimenting, comparing, interpreting, organizing, evaluating, and generalizing. Knowledge thus obtained will be deep-rooted.

Program changes should be concerned with emphasis on comprehension rather than rote skills. Individualization of instruction is necessary. Objectives are often so vague or completely lacking that knowing the student well becomes urgent. Today's high school student is often under tremendous pressure to perform, not because he is interested in content, but to get himself into college. His learning is apt to be memorization without meaning which, of course, will not be lasting. Getting into college is not satisfying to many because there is still no genuine interest in learning, but rather a main interest in avoiding a life of hard labor, military service, or small monetary rewards. Under such conditions the strain of memorization becomes greater, the sweetness of learning turns to bitterness, and both teacher and student are apt to turn to shortcuts and innovations without thoroughly understanding their possible results.

The primary value of teaching aids is to strengthen favorable attitudes and supplement other resources and information, extending the environment and broadening interest and application. Programing was designed and introduced to immediately reinforce and to individualize learning. All are tremendously effective if the motivation is there. The prime objective is still to develop a genuine interest in *learning for a reason.*

Occupational motives furnish guidelines for establishment of programs. Students must see relationship between their learning and the uses they can make of it. If the relationship cannot be established, study time is wasted.

There are four advantages of emphasizing the fundamental structure of a subject: (1) Understanding fundamentals makes a subject more comprehensible; (2) details must fit into the structural pattern to be retained; (3) transfer of learning is completely dependent upon comprehension of fundamental principles; and (4) constant evaluation of content as to its place in the structural pattern keeps the mind on the main track.

The purpose of using any aid or method should be to promote learning and to clarify the relationship of information to application. Programing or the use of programed material, even though it may fail in some respects, will certainly help educators to plan more analytically, considering goals, sequence, speeds, individual abilities and differences, and evaluating according to application.

Motivation and purpose will always remain the key to learning, so appreciation for skills, beauty, efficiency and fellowmen should be the focal point. ■

DR. ELMER S. CIANCONE

Professor of Industrial Education, Indiana State University
Terre Haute, Indiana

What Dr. Ralph Tyler has said is typical of the philosophies currently being expressed by men directly or indirectly involved with American education. He has suggested many solutions; however, no pat answer is advanced. It would appear that industrial arts education has the answer to this dilemma. All that is needed is coordination, consistency in thinking, and unity in implementation.

We are reminded of our rapidly changing American technology; that jobs in industry are decreasing, that in the years to come fewer people will be engaged in "production, distribution, sale and advertising of material goods." Also, the functions of parenthood are no longer simple and consistent: the family can no longer be depended upon to educate its children with directions toward most occupations. We are faced with inducting our children into a society that is totally unfamiliar to us. This places the responsibility more and more upon the schools—a responsibility that may become too enormous, even for our most progressive schools.

When Dr. Tyler referred to the fact that the "non-material" needs of our people are becoming more significantly important than ever before, he is suggesting change to industrial arts. The non-material need of people for recreation can be met through the renewed emphasis upon leisure-time activities as an objective of industrial arts.

Technology also places greater demands upon the personal and social lives of our people. The development of rational powers through the teaching of creativity and problem-solving in industrial arts should become increasingly important.

Dr. Tyler's inference toward general school curriculum revision is worthy of note. Reference to "the emphasis now is on the ability to meet new situations, on how, not what to learn," becomes a keynote to our direction. This implies the importance of method over content in the teaching of industrial arts. The ways in which we organize activities for boys and girls in industrial arts certainly becomes more important than what we teach them as subject matter. Perhaps on this we can agree and spend less time and effort in determining the content of our subject.

The fact that industry is changing so rapidly, making it virtually impossible to continually implement such changes in our industrial arts classes, gives us reason to place more emphasis upon techniques and method to improve direction in curriculum innovation. To teach a youngster to think creatively and to develop within him the rational powers are dependent upon the teacher's ability to organize activities that will emphasize these objectives.

"New institutions" suggest method—method will determine and control "flexibility." ■

EVERETT R. GLAZENER

Professor, Industrial Education Department, Texas A&M University

College Station, Texas

All of those present at this convention recognize the implications of our rapidly expanding "revolution," commonly called our technological developments in a space age. We have all heard that 90 per cent of all the scientists that have ever lived are living today, that knowledge is doubling each decade, that public school students on completion of college will enter occupations that do not now exist. Dr. Eric Walker, President of the Pennsylvania State University, made a statement in June of 1965, at the annual convention of the American Society of Engineering Education in Chicago, that further emphasizes these changing times or frontiers. He said, "One half of what we know technically today will be obsolete in ten years, and one-half of what we will need to know technically in ten years has not been developed yet."

As teachers, supervisors, and teacher educators, we should constantly be reminded of and seek answers to such questions as follow: (1) What impact has this knowledge explosion had on the industrial arts area? (2) What is the role of industrial arts? (3) What contribution are we making and can we make to the education of people in this space age? (4) Are we really open-minded and willing to deal with changing educational needs?

The time available does not permit a lengthy discourse but possibly some ideas can be expressed that will cause all of us to think seriously about the problems which face education as a whole, more especially industrial arts, and how these problems relate to our individual situations.

Dr. Tyler mentioned that learning is meaningful for many youths only if they can see a direct connection between what they are learning in school and what they aspire to do in jobs outside of school. It is one of our largest jobs to motivate people to learn at all levels of education. It is not the purpose of industrial arts to be vocational in nature, not vocational in the historical use of the term; but we should recognize that we have a golden opportunity more than ever before for performing guidance functions for prevocational purposes. We still have the natural habitat, if you please, for making learning meaningful. We can offer something to all ability levels if we are only willing to work at the job, to make changes if necessary and to use new methods and/or techniques as we can. Our real problem is working toward implementing those activities we have professed for many years—teaching initiative and cooperation, how to meet and adapt to new situations, how to plan, to accept new ideas, to be flexible—to mention only a few topics.

To delineate my remarks more in relation to the topic assigned for discussion, and being a teacher educator on this symposium, reference is made to illustrate what can be done by teacher educators toward implementing frontier ideas.

Various colleges and universities are experimenting with ideas or doing research in an attempt to determine the value of new theories. Much research, which I prefer to call "action research," is being carried on in less publicized programs of activity. These may bring results which are just as important as any other attempt to implement new ideas.

To use an example with which I am familiar, our own University, Texas A&M, like many others, offers varied programs in our department. Our industrial distribution degree option is one of only a few programs in the nation preparing people for the specific area of industrial sales. Our industrial technology degree option was established at least 16 years ago and has been under constant revision to improve the quality of our graduates for work in areas such as manufacturing or production, purchasing, efficiency engineering or quality control, safety or accident prevention, personnel management, and many others. Often, these men take additional work and go into teaching. The teacher education degree area has not been neglected either. In-service and off-campus courses are available to help up-grade and keep teachers abreast of developments, and conferences are also held on campus for this purpose. Work-study programs are also available. Courses in all bachelor's degree options are designed for particular emphasis on the study of modern industries; industrial production, materials, and processes; and related topics. One laboratory is devoted to this type of learning and offers opportunity for experimentation, research, and critical evaluation of ideas. Further technical development and research are available in the advanced degrees through the doctorate with emphasis on industrial arts, technical, or vocational-industrial education. By these means we attempt to implement new ideas, refine and up-grade traditional ideas, and provide an opportunity for teachers and potential teachers to develop ideas and theories.

Each of us should answer this question: What am I doing to implement new ideas so that my students can learn more, and know how to face the many problems they will meet in this rapidly changing society? ■

DR. RALPH V. STEEB

Florida Consultant for Industrial Arts, Florida State Department of Education
Tallahassee, Florida

An outstanding presentation of new or frontier ideas is always inspiring to industrial arts personnel. We applaud it, congratulate the speaker, and then go home and take up the same teaching cycle where we left it. Thus there is a gap between our philosophers and our practitioners, the teachers.

As evidence of our gap, have you read any of the new books on curriculum change? This week a new book on curriculum development came to my attention. It told of innovations in almost all subject areas by name. Academic subjects were reported, even art, and vocational and technical programs. But no mention was made of industrial arts. Why? Because industrial arts has not been involved in any significant innovation which would warrant its inclusion. We join the missile gap and space gap with our industrial arts gap. Frontier ideas and their implementation have been sparse in industrial arts.

Industrial arts programs in general have been unaffected by our changing culture and changing social arrangements. Even the shock of Sputnik left us unaffected. We continue today to build nice, comfortable take-home projects while change has become an ordinary occurrence in life around us. Adaptation to change, using frontier ideas, has become a necessity for survival in the school curriculum.

When persons like our speaker suggest change, we fall into the common human nature trap, reacting to change in ways which tend to perpetuate our old patterns or programs. We must not become so defensive and entrenched that we fail to react to change or new ideas.

Obstacles to Implementing Frontier Ideas

1. Frontier ideas are usually expressed in theory, philosophy, and impressive papers by learned educators. Such expressions are difficult to translate into practical classroom or laboratory programs and teaching units.

2. Teachers are consumed by the relentless requirements of daily preparation of routine tasks.

Implementation must start outside the classroom, for a teacher can function best when given organized teaching units.

3. Until recently there had been no general, organized leadership group in industrial arts to codify, interpret, and disseminate frontier ideas. In addition, provisions have not been provided to demonstrate to teachers the use, value, or limitations of the ideas.

New ideas must be classified and packaged into teaching units for teachers. To do this we need national commissions or institutes. The circulation of reports and articles is not enough; teachers in the last phase of implementation must be prepared in the practical application of ideas.

4. Teachers generally have been trained to be project-oriented rather than problem-oriented.

5. Many frontier ideas tend toward academic activities to the curtailment of construction activities.

We must retain the basic uniqueness of industrial arts which is the activity, experimenting, and doing experiences.

6. Most teachers desire but lack understanding of the full meaning and implications to life and education of a technical society.

For most teachers modern technology has been a vicarious experience. The college-trained and tradition-oriented teacher must be involved and experience first hand the social, occupational, and technological changes in society. Our technological society is already taking on a structure or pattern. Industrial arts personnel must be involved through direct contact and observation of change.

Implementation of Frontier Ideas Depends Upon These Factors

1. The leadership and content of teacher education programs

Classroom teachers have too limited time to spend on creative, reflective thinking. Therefore, graduate programs, in particular, should organize courses around frontier ideas and how they can be implemented. Rather than writing conventional course outlines as term papers, graduate students should develop plans and proposals for pilot and experimental programs for sound innovation. The key to implementation is in the development of detailed methods.

2. Adequate budget

The implementation of new ideas requires adequate financing.

3. Availability of qualified personnel

The teacher is the final catalyst who makes the ideas work by blending the materials, guides, prior training, and pupils together in an innovative mix. To implement new ideas requires more from teachers. Quality teachers must be available and willing to teach "off dead center" so that the new ideas can develop the highest pupil potential. These teachers must have developed their own potential to a high degree. They must have more than skill and competence in subject content. They must show enthusiasm and excitement for the new ideas. Teacher enthusiasm is contagious to pupils.

4. Careful over-all program planning

New ideas must be placed in proper focus or dimension in the over-all scope and sequence of the industrial arts program. The introduction of innovations must be carefully timed in view of the learning patterns of pupils.

5. Acceptance by the community and parents

Innovations will not succeed unless accepted by the school public. Parents must believe in the idea. Public relations and communications help. It is surprising how prefixing the word modern before a course title makes it acceptable.

6. An evaluation of the potential outcomes

Innovation planners should evaluate the pupil's capacities to use, manipulate, or benefit from the new experiences. The most accurate evaluation of a new idea is based on a test of the idea, not on an evaluation of a statement of fact about it.

7. Exchange of frontier ideas currently in practice

An effective way to motivate the implementation of a new idea is to exchange ideas through communication with personnel who have programs underway. Experiences of others have more meaning than ideas expressed abstractly. Leaders may talk, but to this most teachers are passive. Institutes, workshops, and conventions can present, exchange, and demonstrate innovative methods, techniques, and content which will stimulate others to reappraise their programs for the possible implementation of the observed innovation. Effective teachers constantly look for program improvement ideas.

We have three tasks: to accumulate, classify, and disseminate frontier ideas as they become known; to implement the new ideas by converting the theories and philosophy to classroom practice and teaching units; and to convince others of the values of frontier ideas as a part of the industrial arts program for preparing youth for tomorrow's unknown technical world.

Implementing frontier ideas will create more realistic programs for satisfying pupil needs. But implementation is not automatic. It must be planned.

Every day, every year change and innovation surround us. Industry and society become more technical. Yet industrial arts programs display a reluctance to depart from the traditional. The question is still unanswered. Can industrial arts programs and personnel implement frontier ideas and bridge the gap? With teacher institutes and national commissions now being organized, it can. ■

SEBASTIAN "BUD" GALLARO

Pacific Grove Junior High School
Pacific Grove, California

In industrial education, changes are being made every day in curriculum and educational goals. Our federal and state governments have influenced the many changes we are making in our curriculum with the mandate to provide job training for our students and to re-train adults for new jobs. One of the major obstacles we face in industrial education is having three related programs. We have industrial arts, which is part of general education; vocational education, for specific job training; and technical education, which is occupational training with a strong science and math background.

Many of our large school districts can and do have these three programs in their school. Where we neglect our students and run into financial problems is where a school district cannot afford to have the two or three programs. The school district will usually have an industrial arts program, which is fine for most of the students, but many students could benefit from occupational training. Before we try to implement new ideas, we should take a hard and long look at our existing programs and try to improve, upgrade and update these programs; and while we are making changes, we might seriously consider discarding the titles of industrial arts, vocational education, and technical education and use industrial-technical education to cover the entire field.

With the vast money being distributed to our schools for industrial education, industrial arts has not had an equal opportunity to innovate or help innovate programs in industrial education. The Bureau of Industrial Education for the State of California has been working on a position paper for industrial education. This paper brings forth the many problems that confront us in industrial education, where we have similar programs, but different philosophies and goals. This position paper states: "It is such a time in the mid-sixties of the twentieth century, and it, therefore, seems appropriate that the basic philosophy and practice of industrial education be re-examined and re-stated in light of present and future needs and the evolution that has taken place since."

Another obstacle we have in trying to make changes in our field is that some leaders who are set in their ways just give lip-service to any change or innovation that is proposed. To quote from Mr. Gerald Leighbody's recent article in *School Shop,* "What we need are leaders with the outlook described by Charles Kettering when he spoke of ' . . . A friendly, welcoming attitude toward change . . . the problem-solving mind, as contrasted with the let-well-enough-alone mind, the composer mind instead of the fiddler mind, the tomorrow mind instead of the yesterday mind.' "

In California we have Article 8.1 which allows industrial arts teachers the opportunity to secure a vocational credential, and vocational teachers to secure an industrial arts credential. Although everyone is not pleased with Article 8.1, it is a step in the right direction toward improving industrial education offerings to our youth.

In summary, we can implement Dr. Tyler's *Frontier Ideas* by the following:

1. We should continue to meet the needs of our advancing technological society.
2. We need flexibility in our industrial education programs.
3. We might have to consider changes in our philosophies, goals and titles.
4. Leaders must have a positive approach on proposed innovations. ■

Symposium H

FRED A. BAER

Supervisor, Industrial Arts, Los Angeles City Schools
Los Angeles, California

The challenge of developing new institutions to deal with the new problems in our changing technology can be met if those of us concerned with solving these problems will direct our efforts toward their solution.

Focus your attention particularly on the problems of those pupils in the category which will have difficulty being a part of the half of the population which will produce the goods and services needed in our country. I speak of the slow learners. The bright students will probably make it in spite of us, but the slow ones need help desperately. Many of these slow students *can do,* and will understand *how to* if properly motivated.

The industrial arts program can be meaningful to them if it relates to the modern industry and society in which they will be involved. We must increase motivation by identifying industrial arts with modern industry. This may be done through carefully planned field trips and well-made films that emphasize the role of people in industry rather than production and processes. The student must be able to see himself in industry, some day, in some role. If he cannot do this, why should he work and study? He must want to be a productive citizen with a role to play in our industrial society.

The slow student's confidence in himself must be developed; he must achieve some degree of success. We can help the student do this if we let him work with the concrete first and then go to the abstract, to the degree that he is able to handle abstractions.

There are ways in which we can do this. One method is homogeneous ability grouping by intelligence. Let the pupil compete with his peers—with those who work at his rate of speed. Let him achieve some success using some construction aids such as templets and jigs. As he gains confidence, feels more secure, we take away some of the aids and direct him into more abstract problem-solving situations to the degree that he can handle them.

We need to do something about his poor work habits, his "how to learn" approach with less concern about what to learn. The knowledge explosion and rate of change make it difficult to determine what should be taught. Half of our students will work at jobs which do not exist today. Will this half be only the above average, or must it include the below average?

In addition to teaching them the basic industrial fundamentals, the contributions we make to these slow learners that will help them, regardless of their future jobs, relate to human behavior and attitudes. They can learn to be on time, put in a full hour's work, follow directions, have pride in their work, cooperate with others, work safely. Let us develop some group projects for our pupils. They must understand the importance of working with others—getting along, helping, following directions, doing their part. These are the values which help them compete, and keep a job. Teachers can do much about these attitudes. If we want a pupil to learn the value of time and effort, then let's be certain as teachers we don't waste time as we teach our classes. To help pupils develop pride in a job well done, we as teachers must reflect pride in what we have done in teaching these slow learners.

If I seem preoccupied with relating the challenges to the problems of our slower pupils, it is because I cannot forget there seem to be so many of them. If the average I.Q. is 100, or thereabouts, there must be a great number below 100. They will be hard pressed to succeed in the demanding technology of their future adult life. Our above-average students also need motivation and challenges, but I suspect they will survive and cope with the new problems they will meet. I would emphasize that we must not overlook their needs, but it is the slow learner who *must* have our help. Mother subject fields have little to offer these pupils. We must look for new and innovative methods of working with the slow learner. Without new motivation to build incentive to learn and perform, these students, as adults, will be lost to relief rolls, doles or even prisons. The costs of proper education for these students is little compared to the alternative of lifetimes on welfare rolls.

Dr. Tyler's challenges for the new frontiers are many. They affect all youth and our responsibility is to all youth, yet some seem to need more help than others. Let us be certain we give the help where needed. ■

JOHN O. CONWAY

Professor, Division of Industrial Education, Indiana State University
Terre Haute, Indiana

Education is the system by which a society creates its future, inducts the young into the culture, and provides the means for the modification of the society in a desired direction.

Educators concerned with improving the curriculum of the schools must obtain an indication of the type of change that is needed by an analysis of goals of the society of the future.

If we review the historical development which lead to the establishment of the industrial arts programs in the public schools, we realize that a major factor was the Industrial Revolution of the eighteenth century. This was to become the most powerful economic and social force in history. After about two centuries of technological progress since the first machine tools, we now stand on the brink of another revolution or the age of automation, computers, space travel, and cybernetics.

In this age, time has been telescoped by scientific development and technology. The gap between scientific theory and invention, and production has been reduced to a very brief period of time.

An example of this may be the record of the first installations of computers for use in business and industry in 1954. Today, eleven years later, the estimated installation of computers is over 30,000 with another 10,000 to 12,000 on order. The gross value of American computer shipments during 1965 was over $2.3 billion and it is estimated that this will increase to over $3 billion in 1966.

The study also reveals that there are over 800 areas of work to which the computers have been applied to date.

Science and technology have come to affect every aspect of our lives, and as a result, society is changing at an unprecedented rate of speed. The problems of selecting the right pattern of education is growing more complex and difficult.

In view of this accelerated rate of scientific developments, of technological change, it is no longer possible to teach a person what he should think or what theories have already been developed. We must teach students to think and how to learn so that he can make sense out of the continually altering world of new facts, to solve the problems which these new discoveries will create in the social-economic world, and for the future.

It has been suggested that every employed person will be engaged in a career race between obsolescence and retirement. He can only hope for a photo finish if he is enrolled in a lifetime learning league. This will require a revolution in the current system of education of which industrial arts is a part. We must develop a program to engineer an educational system and social order to meet the needs of the youth of the future.

May I suggest that we in industrial arts teacher education must learn how to utilize the versatile educational tools of computer-aided instruction systems to assist in improving and keeping the instructional content current. As a part of this system we must incorporate the science of cybernetics to make it possible to cope with the vast explosion of knowledge.

Another important aspect of using the computers in the educational design process of the simulation of models is to pretest or test the design of the model prior to the actual construction of the real model. This simulation system can save considerable time as well as cost in determining the reliability and effectiveness of the model in meeting a given set of specifications.

What are the implications of these ideas for the future of industrial arts education?

1. Just as machine tools created the industrial revolution and altered the old agricultural society, these new tools—*computers, automation,* and *cybernetics*—are now starting to transform our lives and our social system. The speed of this transformation will accelerate with time.
2. The industrial arts teacher educator must learn of the capabilities of these new tools and develop methods of incorporating them into the continually changing program of teacher education to keep current with the scientific, cultural, and technological changes.
3. We must also develop a close relationship with the sociologists, the psychologists, the industrial researchers and developers, to avoid the social problems which followed the industrial revolution of the past.

In conclusion, may I suggest that this educational revolution may erase many subjects from the curriculum as we know it today. ■

HARVEY C. HART

Fontana High School
Fontana, California

Some time ago I read an article in a monthly periodical entitled *Why the Dole Doesn't Work,* and another in a week-end periodical entitled *The Poor Don't Want to be Middle Class.* Both writings point out some of the fallacies wrapped up in the great give-away programs we find across our nation today.

Somehow we've bred a great host of beings whose philosophy is "What's in it for me?", and when the values of *knowing* and *being* are pointed out, the immediate statement is "Prove it."

It seems our value system has become rather confused and desires have become needs. If one doesn't own a color TV and a late model automobile, his needs are not being met.

Where has been lost the thrill of a job well done and pride in craftsmanship that created this Great Society we call the United States? How has the emphasis regressed from what you know and what you accomplish, to Whom you know and what you don't accomplish?

What great athlete has achieved recognition without great effort? What recognized musician has achieved acclaim without thousands of hours of practice? And who has not heard said, "I don't want my son or daughter to go through what I've gone through to make his place in society,"—thus depriving the offspring of the very foundation of success itself.

Industrial educators meet with citizens' groups of all varieties in an attempt to ascertain the needs of the community. The plaintive cry consistently heard is, "Send us mature young people, boys and girls who know how to think, well-founded in the three 'r's,' not afraid to work, and with more than an ample supply of initiative."

I'm not sure how industrial education is responsible for students not being able to read or spell or write, but I'm certain that all too often math is taught for mathematics' sake by a mathmatician in the math department, when it would have much more meaning and motivation if taught with an industrial application by an industrial educator.

More and more we are seeing courses of the applied physics variety springing up in industrial education departments across our nation, with their emphasis on testing and measuring materials and elements.

How about industrial English with an emphasis on technical vocabulary and terminology, with writing skills being developed through report-writing and research papers—or maybe a history course with an emphasis on the industrial revolution, or maybe one of the latest innovations, the inter-disciplinary approach to education.

The most significant suggestion I might make for implementing a program designed to up-grade education would be an occupational orientation program, grades one through twelve.

By this, I mean orientation to all facets of the workaday world. Many young people have no concept of what it is like to go to work in the morning, to have a job consistently or to receive a paycheck from a source other than a government welfare program. Many others have never been taught reliability nor have they been required to achieve or accomplish any goal. We need to help youth realize that our entire economy is geared to production.

Somehow we need to indoctrinate students, at an early age, with a desire to achieve and a pride in accomplishment. Some way we need to make both parent and child aware of the opportunities available to those who achieve, and I do not believe that we can continue to provide the apparent rewards to the non-achiever that we also award to those who do achieve. We need to educate the parents as well as the student, to help them better understand this highly complex society in which we live and to dispel the stigma that now so often accompanies a manipulative occupation, that the parents themselves may find satisfaction in a productive life.

Certainly, with all the mass media at our disposal, with all of the intelligentsia of the United States, with all of the fabulous wealth of this great country, we should be able to come up with the financial support and a program capable of developing a sense of the worth of man and of the value of work. A united front, if you will, for the betterment of society and education in the United States, so that people are given an opportunity to do and get paid for what they do—not for what they do not do. ■

WILLIAM E. DUGGER

Martinsville High School
Martinsville, Virginia

From Dr. Tyler's speech on frontier ideas in industrial arts education, there are two of his points that I would like to discuss:

Emphasis Now is on the Ability to Meet New Situations, on How, Not What to Learn

The more I teach, the more important I think the teacher is. It is not so important what we teach but how we teach it. The influence that the teacher has is of much greater importance than a 7,000-ohm resistor or a piece of block walnut or an orthographic projection. We, and I include myself in this criticism, often tend to forget the student as a human and we stress too much the technological aspect of our society although technology places demands on education; what the technology does to the boy or girl is more important than what the boy or girl does to technology.

In an industrial arts laboratory where good teaching is evident, a student learns and also learns *how* to learn. The needs of the student as well as the needs of education are met. However, in an industrial arts laboratory where *poor* teaching is evident, a student may become a problem just as he might in a poorly taught class in any other area. As industrial arts teachers and educators we have the opportunity to get closer to the student than other teachers with the exception of the physical education coach.

Further, since students will seldom exceed the knowledge, creativity, and capability of an instructor, it is almost mandatory that the industrial arts teacher be a master in meeting new situations—a resourceful person who really knows *how* to learn and how to teach, as well as what to learn and what to teach.

Make the Program as Meaningful as Possible to the Student

Again the key to the success or failure of any course is the teacher of that course. Students should be inspired by a teacher who is really interested in what he or she is teaching and then learning takes place.

We have in our school a special course which is designed to train for a vocation boys who were drop-outs or who are potential drop-outs. We believe that one of the reasons why these boys didn't like school was that the school didn't offer anything for them. They were ignored in academic classes because they were far behind and as a result they caused disciplinary problems. The teacher who was selected to teach these boys was himself a high school drop-out who had finally earned his diploma after his stint in the Navy. To my knowledge he never had a course in education before teaching but he had two other excellent qualities: he had a profound interest in young people and he knew his line of work, which was the machine shop. In three years his program has tripled in size and he is now earning his degree in industrial arts education. He is one of the finest teachers I have ever known because he makes the program meaningful to the students.

Although technology is important, it is still not as important as the teacher who creates in the student a desire to learn. I think that Mrs. Luanna Trout at last year's AIAA convention in Tulsa said best what I am trying to say today: "I have not brought life to teaching, teaching has brought life to me." Every teacher has philosophy that comes from his student's lives flowing into his life. I wish to share a brief portion of my philosophy with you.

I touch the face of humanity each day in my classrooms, for I teach the ambitious and the indolent, the brilliant and the slow, the mature and the immature. I gaze at a quiet classroom, heads bent, minds intent on the lesson. I catch the enthusiasm of the eager search of a bright-eyed young scholar for an answer to his question. Teaching is my profession, my way of life, my opportunity to live richly and deeply, my fulfillment of that which is useful, beautiful, and true.

I know there is not one teacher of the year, for every teacher has the opportunity to be teacher of the moment for a child, teacher of the hour for a certain class, and teacher of the year for a certain school. The master teacher is and always will be the soul of American education.

Surely the teacher is the key to educating our youth in a technological society. ■

STANLEY E. SWEET

Pinellas County Schools

Clearwater, Florida

Technology is one of the principal means by which the needs of our expanding society will continue to be met. On a world basis, there has been a giant explosion of technology—a bringing together of cultures and people through instant electronic communications and jet-age travel. In our own country, technology has given man new ideas about himself and the way he wants to live.

The challenges brought about by this technical change and with the rapid obsolescence of machinery and products are taxing the abilities of industry to stay abreast of current developments.

New technology has compressed and intensified competition. In furnishing technology and the skills in the massive quantities needed to keep America great, decreasing opportunities are found for the untrained and unskilled.

Because of ingenuity and American industriousness, at the present time our material needs can be produced by less than one-half our working population. Technology has drawn the world closer together and made it more interdependent, and educational requirements have increased. Our educational system is strained to provide the high level of education required by technology, to keep the retired people occupied, to retrain the unemployed, and to prevent drop-outs through tutorial programs.

Whole families need to be educated because the family's function of guiding their children in what their occupations should be, is no longer simple for parents, because 65 per cent of our children will function on jobs that the parents themselves never knew.

Our personal life has been exhilarated through technology. Cultural and recreational activities, such as hi-fi, books and novels, camping and travel and other leisure time activities, require ever-increasing educational opportunities to carry the people enjoying these activities on at a rewardingly higher level.

All of these technological changes affect education. Our country reaches about 80 per cent of our children, while the requirements of our society make it necessary that each person be productively employed.

Because of the higher demands, education is now faced with the task of educating a much larger proportion of young people. Educators must also cultivate new attitudes toward education with emphasis upon the ability to meet new situations, on how, not what to learn. Because technological changes are occurring at such great speed, young people must be trained so that they can quickly adapt themselves to new methods and new ideas.

One way to attack this task is to develop new institutions to deal with new curricula developed to teach new innovations and methods. The occupational motives and needs of the students must be made meaningful with a direct connection between what they are learning in school and what they aspire to do in jobs outside of school.

This approach was developed through the Rochester Institute of Technology in which a curriculum was devised to educate the students so that subject matter could be related to technical occupations. The curriculum was devised to concentrate on concrete tasks first and abstract things, such as mathematics, second. In this way, students could develop abstractions as the need for abstract principles became necessary, instead of jumping right into calculus.

The Rochester program demonstrated that limitations among students are not due to the lack of ability, but lack of proper motivation, lack of confidence and poor working habits. The educational problems we face in an age of technology can be best met by imaginative effort and hard work. ■

Symposium I

BEN R. AIELLO

Woods Antioch High School
Antioch, California

A unit in manufacturing in the school shop, which has been tried and proven by many teachers to be of excellent educational value, should be included in every industrial arts program in areas where application becomes feasible.

Our changing society and technology are placing great demands on us to create new programs that more clearly reflect the educational needs for the present and future. Industrial arts teachers are hard pressed to come forth with new ideas, new programs and innovations to supplement or replace their present outmoded programs. These pressures are evident from educators, administrators, and industry.

During the past year, the manufacturing unit was introduced into the regularly scheduled advanced wood class at Antioch High School. This class includes second year juniors and seniors (a mixed ability group basically from the lower 40 per cent). The reaction was negative; there was no enthusiasm. Students had no ideas or understanding of the manufacturing concept. With some teacher direction, lectures, discussion and a field trip, enough interest was created so that it was agreed to try this unit.

The product was a teacher-initiated and directed choice, the objective being to choose a product with a ready and easily available market and give the program a chance to take off. The product chosen was a "handy desk file," made up of a wooden base and aluminum rod partitions. Target market was school personnel within the district. A sales crew traveling from school-to-school left a sample and order blank and then returned to fill orders as production progressed. The manufacturing unit was a half-year program.

During the manufacturing unit these activities were explored: selecting a product for resale, research and development, job analysis, production flow and plant layout, material analysis, designing and building jigs and fixtures, assembly line work, record keeping, marketing, advertising profits. profits.

Student reactions and behaviors were interesting. Self-styled leaders proved bluffers; trouble-makers proved potential leaders; constant-failure students found success and satisfaction in performing one-operation jobs.

The success of the manufacturing unit has attracted the interest of local educators and other area disciplines. As a result, it is possible that a program involving other disciplines can be organized. The proposed course name for such a new venture could well be "industrial production technology."

Our objective is to gear such a program to the type of student generally found in the lower 40 per cent. These are the "in-betweens," neither terminal nor college preparatory. The success of any teacher-initiated innovation, however, is dependent upon administration cooperation and encouragement if industrial arts education is to progress to meet the challenges and needs of present-day technology. ■

CARL G. BRUNER

Coordinator/Technical, Industrial, and Vocational Education, Wichita Public Schools
Wichita, Kansas

We find ourselves in substantial agreement with the remarks made by Dr. Ralph W. Tyler. However, one should object to the implication that, since less than one-half of the population with modern automatic equipment can take care of all of our essential needs, the rest of the populace should be denied the feeling of self-sufficiency that comes with constructive, profitable employment. Luckily, our demand for goods and services expands with the expanding economy and the availability of leisure time. A young man can make as good a living building boats, airplanes, camp equipment, and fishing tackle as he could years ago building farm machinery or housing. New jobs and new avenues for service and profit are opening up every day for those who seek them.

We feel strongly that everyone should be trained to render a service for which there is a demand or need and for which someone is willing to pay. There is no need for "drones" in our society. Industrial arts can supply the introduction to materials and fabrication methods basic to many avenues of employment. The industrial arts program is desirable preparation for sales and service, advertising and merchandising, design and engineering, as well as for manufacturing.

Everyone should be trained, also, to occupy his leisure in a productive manner. We like the definition of leisure used by Dr. Mortimer Adler: "Leisure consists of all those intrinsic activities by which a human being grows morally, mentally, spiritually, and contributes to the good of society. The essence of leisure is the activity by which human beings grow and society advances." In other words, leisure is constructive working or thinking without a time schedule and without expectation of monetary reward. Even if the leisure group is going to sit and discuss, they need tables and chairs; the room is likely to be automated. The interest in gadgets, as well as the use of more sophisticated devices of all types for work and play, result in many opportunities for profitable employment for those who wish to supply these needs.

In addition to the above activities which grow out of someone's needs, there are many things which someone might choose to do for his own enjoyment. A very large percentage of the men and women who have been questioned on recent surveys find it relaxing and interesting to make things with their own hands. Such creative activities run the gamut from knitting to cabinet making—all good industrial arts activities.

Because a course was taught in a certain way, or the fact that a given course was included in the school's traditional offering, is not sufficient reason to continue the activity. Change is in the air; everything is in a state of flux. All of our traditional theories need to be reexamined. Industrial arts must meet the challenge of the space age. What must be done is quite clear. Urgent is the need for:

1. Creative thinking supported by adequate research and experimentation to develop better and more effective teacher training methods. Industrial education needs better teachers. These new teachers need vastly improved preparation. Through college classes, internships, and cooperative training in industry, the industrial arts teacher must develop proficiency in method and mastery of content.

2. Creative thinking supported by adequate research and experimentation to develop more imaginative leadership, new courses, and new methods. How do we know that all of our subject offerings should not be thrown out and new courses designed under new titles? In place of wood, metals, electricity, and auto mechanics—why not communications, transportation, instrumentation, and cybernetics?

3. Creative thinking supported by adequate research and experimentation to develop more effective techniques for communication between the school and industry, between the schools and the patrons, between the teacher trainers and the secondary school supervisory group, and between the counselors and the industrial arts teachers.

4. Creative thinking supported by adequate research to identify the respective roles of the industrial arts, occupational training, and academic classes in the preparation of young people for successful participation in adult life. The impact of the idea that education and training never stops, but that the need will continue throughout one's active career, needs to be assessed. Note: When research is mentioned in the foregoing statements, major projects are indicated. Fortunately, funds are available through a number of channels for well-conceived studies. This major research task cannot be done by teachers, working independently, mailing out a few questionnaire sheets, and rendering an inexpert appraisal of the returns. The research group must not be dominated by academically-oriented college men and women with a preconceived notion of the results to be expected. ■

CHRIS H. GRONEMAN

Texas A&M University

College Station, Texas

The industrial technology in this country is advancing at such a tremendous speed that professional engineers and scientists find it very difficult to keep up with modern trends. The advances per month in this era are as great, if not greater, than those 30 years ago for a calendar year. The pace is much more accelerated than our technical knowledge. Scientists, engineers and specialists in the medical profession have constant need for seminars and short courses to keep abreast of changing times.

One of the major objectives of education is that youth develop arts and practices of effective citizenship. This means that youth must develop competencies in industrial arts which will enable them to understand contemporary life and occupy resourceful roles.

Industrial arts can be the firm foundation where the student learns specific skills or non-skills; where he can stand while he expands his horizon of living; where he has a pad from which to launch into our challenging society. He knows he has something to offer, has accomplished a definite thing, and therefore can speak and act with confidence and enthusiasm.

The many federally-funded programs in operation today are of such a nature that thirty million people are eligible for educational assistance. None of these programs provides a magic formula for guaranteed success, but a combination certainly should up-grade the general level of understanding, achievement and progress.

Dr. James Kingsbury, Chief of the Engineering Branch of the George C. Marshall Space Flight Center in Huntsville, Alabama, stated that the American industry and public would receive back two dollars for every dollar spent in the space program. This would be through improved industrial products and commodities. Already, we are receiving the benefits through many new types of materials, he stated. This means a constant inservice improvement and upgrading of our knowledge of this industrially complex technology.

In closing I would like to give you two observations which were made this past summer at an annual convention of the American Society for Engineering Education. Dr. Eric Walker, President of Pennsylvania State University, an eminent educator and engineer, made these two pertinent and startling statements: (1) one-half of what we know today technically will be obsolete in ten years from today, and (2) one-half of what we need to know technically in ten years from now has not been developed or has not come to light yet. This is a challenging state of affairs.

Perhaps this explains the need for a constant up-grading and improvement for industrial arts teachers through advanced education in seminars, summer programs and NDEA institutes. These are all realities which are commanding respect by teachers and support by administrators.

Are we keeping abreast with the demands of the future? Are we in focus so that we can keep pace with the future in industrial arts? ■

ROBERT A. HARDIN

University of Oklahoma
Norman, Oklahoma

One of the biggest problems facing educators today is how to better prepare boys and girls to cope with rapid changes in industrial life. Undoubtedly, the problems would be as difficult, if not more so if we were forced to change, in five or ten years, from the cybernetic age back to the horse and buggy age. The main issue then, is how to learn to adjust to constantly changing ways of living and doing things. A person equipped with such abilities has little to fear when his job disappears and another must take its place.

If this is the problem then wherein lies the solution? It would perhaps be more simple if we could identify certain elements that are basic in a continually evolving educational plan, and that are essential in implementing frontier ideas in industrial arts education. For the purposes of this presentation let us assume that there are three basic elements in an education plan designed to prepare for living in the cybernetic age. They are: (1) development of skills; (2) establishing an awareness of standards of excellence; and (3) nurturing problem solving systems. Implementing instruction intended to achieve these elements necessarily calls for a fourth major effort, that of up-dating teachers and administrators to an education founded on these basic elements. Let us consider each of these elements in turn.

Skills

The intention in the teaching of skills is to help boys and girls to do better those things we normally expect them to do as part of daily living, such as reading, writing, computing, using a hand saw, a brace and bit, a screwdriver, etc. What is not generally known is that even with automated production of automobiles, utensils, corn and potatoes, there is an increasing demand for competence in skills. Tape-operated machines are not made by other tape-operated machines. They are made by people with job shop skills. There is a need for re-emphasis on all basic skills.

Standards of Excellence

How good is "good"? How bad is "bad"? What is "perfect"? Does industry follow one set of standards, the home another, and the school still another? Of course, anywhere you look at it, two plus two equals four. It is never five or four and one-half, and the solution of a mathematical problem may show perfection wherever it is done. In industry, good may be plus or minus one ten thousandths of an inch. Certainly gauge blocks made within four millionths of an inch must approach perfection. In business one may be termed good if he succeeds and bad if he fails. Will he be better than good if he does it honestly? Or near perfection if he is especially pleased with a satisfied customer?

In many of our school systems we have "pulled a real Donnybrook" in passing all pupils along from grade to grade without their having attained certain standards of excellence. Pupils are receiving a high school diploma and are, in effect, being told that they are now prepared to enter the university. As a matter of fact large numbers of them are unprepared to enter *anything* because they have not been required to meet standards of excellence that will make them competitive with the demands of modern living. They are, in effect, being trained to take places in a world that *does not even exist.*

In industrial arts, or in any curriculum area in which skills are taught, it is probably as important, if not more so, to emphasize the concept of standards of excellence as it is to develop a skill. As a matter of fact, I do not know how one *can* develop skill in using a welding torch or a milling machine or master a concept in history without knowing how good is "good" or what is "perfect," and especially, how bad is "bad."

Nurturing Problem-Solving Systems

Perhaps the term "problem solving," being a much hackneyed expression, is not the most appropriate in this discussion. What we have in mind here is not limited to determining the sum of a series of numbers, nor satisfactorily building a bird house, nor being able to navigate a freeway. Rather we are thinking in terms of systematically seeking solutions to problems in all phases of living, whether they be problems in mathematics, in designing a bridge, seeking other than superficial answers to questions of divinity, or developing electronic circuits for purposes new to the learner.

Time will not permit more discussion of the part of the topic, but may I propose that one of the basic endeavors of education should be development of research capabilities, not necessarily in order to implement graduate research, but to seek answers in an organized way to all problems of daily living.

Up-Dating Teachers

Attending summer school simply to get more credits toward a master's degree probably is not the answer. Teaching more of the same thing most definitely is not the answer. Another course in the history of industrial arts or in methods of teaching probably will not suffice. The solution could well be made the business of a carefully selected panel of teachers working and "brainstorming" over a period of weeks.

There is a wonderful opportunity for summer institutions for advanced study in this area, partially financed by NDEA, Title XI. Plans of a number of teacher training institutions in this direction have come to my attention. To my mind an ideal summer institute would be one meant to do the following·

a. Determine what are the concepts of industry basic to living successfully in today's world that can be reasonably developed in industrial arts shops.
b. How can we implement and program our teaching to teach these concepts.

All of these things we must incorporate into any educational plan intended to implement frontier ideas in industrial arts education, and all students who have participated in an education plan involving the preceding basic ideas will not be out of place in either today's world or the world of tomorrow. ■

ROBERT RYAN

St. Cloud State College
St. Cloud, Minnesota

Dr. Tyler has hit upon the term which may go down in history as the key word for this era—CHANGE.

The question then which might be posed to us might be, "Where are we going, or where have we been?" Could our only reply be that the change has overtaken us and we missed the opportunity which was offered?

Vice President Hubert Humphrey recently stated that "Education is the key to employment, the key to better living and the key to the future. Education will provide us with the greatest challenge posed by our present age." Education, yes industrial arts education, must undergo the most dramatic changes in recorded history if we are to accommodate the needs of this advancing technological era. Secondary schools will have to change curricula. New facilities will have to be built. Colleges will have to have access to their offerings and expand where necessary.

The foregoing are bold assertions; they are not, however, without firm grounds. Initially we must look at what is happening and what is likely to happen. We as a nation are producing more goods than ever before and with fewer people involved in the process. There is a greater demand for broadly educated, well-trained people in all phases of employment. Automation is displacing more and more jobs of the unskilled and semiskilled, and now is encroaching on other areas. These are just a few of the many influences upon education which this country is going to have to face squarely and progressively. This new "institution of education" is going to have to begin with "carefully" thought out programs by forward-looking individuals.

One of the greatest single factors which has come about within recent years and poses one of the greatest challenges to education is automation. The immediate question that arises is, "Will the present trend of automation in virtually all aspects of technology be detrimental to industrial arts education?"

Quite the contrary, I feel that our programs will tend to be enhanced because of automation and technology. Industrial arts education must be concerned with adapting to automation and change. Automation can do for industrial arts what the computer has done for mathematics, a greater emphasis and demand for the basics. If an individual is to work with and have command of the automated processes, he must have a solid background, understanding and degree of competency with the fundamentals of the process. If this basic knowledge is lacking, the individual could not hope to comprehend the automated process.

Automation is producing a new environment. We are rushing into a period, and it more than likely is permanent, where the chief characteristic of our entire society is change. If education can adjust to this change and new demands, we will witness the greatest educational revolution the world has ever seen.

I feel the ultimate challenge of automation and the greatest decision of our time was stated by John Diebold, an expert on automation. He said "The biggest problem is to decide what on earth you want to do just because you can do it." ■

EARL R. ZIMMERMAN

State Supervisor, Industrial Arts Education
Pennsylvania State Department of Public Instruction
Harrisburg, Pennsylvania

Our responsibility during this symposium is to give ideas to implement some of the challenges presented by Doctor Tyler.

We need to reach more students, curb the dropout problem, teach for learning easiness, know the desired interest and abilities of our pupils; and to bridge the gap between world reality and the classroom. This is a serious task. An effort should be made by all educators to use every ounce of strength available to meet these needs.

We in the Commonwealth of Pennsylvania know that every boy and girl needs the experience of how to get along with one another. Humane relations is experienced in industrial arts more than in any other area of education but seldom recognized. The use of personnel systems, group projects, and general work experiences in the laboratory does a lot to expose pupils to this challenge.

Team teaching is very useful in an industrial arts laboratory. Our teachers' image is changing because they see the necessity to help each other. We are no longer just hammer and saw teachers. Teachers in a school district should include an industrial arts teacher on their teams of teachers because (1) we have a vast knowledge of activities, (2) no other teacher has a cross-section of experience that matches that of an industrial arts teacher. We then could take part in a team-teaching situation. (Example: world cultures.)

Many decades ago we felt a student followed his father's occupation. However, this is not so today. Many children lack knowledge of their father's occupations. Therefore, exposure of all pupils to numerous types of experience is necessary. Be as exploratory as possible when describing the various procedures in industry.

Girls have a definite place in industrial arts education. Not permitting girls to elect industrial arts deprives them of total development for life experiences. A girl dropout is more of a problem than a boy dropout. Industrial arts has a definite part to play in the experience of *all* pupils—not just boys.

Institutes under the National Defense Education Act, Title XI, are vital to industrial arts. Our teachers are all project-oriented people. They need to have an insight into new methods of teaching, although it may lead to a project. The industrial arts teacher should have an opportunity to upgrade himself. I prescribe an institute to be held in a laboratory where live teaching can be experienced by every member participating. I do not approve of a course of lectures regarding the methods of teaching.

Industrial arts in the Commonwealth of Pennsylvania is moving ahead in a united effort by using the definition and the five general objectives stated below.

Definition

Industrial arts is that integral part of the *total program* of education designed to aid students in acquiring a comprehension of technology. Through manipulative and research experiences with a variety of tools, materials, processes and products, pupils have opportunities to develop their self-concept in relationship to the changing requirements for optimum participation in an industrial-technological culture.

Industrial arts is non-vocational instruction in the sense that it does not strive to develop saleable job skills. It is of value to all pupils in the elementary and secondary schools, providing experiences that are progressively intensive in accordance with pupil maturity.

Objectives of Industrial Arts

To provide a sound program of industrial arts, clear and realistic objectives are essential. The following statements of purpose are unique to industrial arts education:

1. *To develop literacy in a technological civilization.* In such a society one must be able to *communicate* in the language of industry, technology, and science. Hence, he must be able to read drawings and make sketches as a first step in understanding our industrial society. This

ability to read and sketch drawings is related to things of a technical nature much as reading and writing are associated with learning history or mathematics.

2. *To develop an insight and understanding of industry and its place in our society.* Since industry is a constructive, dynamic force in the world today, it is the responsibility of the school to provide opportunities for each student to understand this force. Industrial arts provides significant learning activities in which students acquire knowledge and skill in performance through study and application.

3. *To discover and develop student talents.* The school's responsibility is to assist students in discovering and developing their talents. It is the responsibility of industrial arts education to identify special abilities though manipulative and research experiences.

4. *To develop problem-solving abilities related to a variety of tools, materials, processes, and products.* The problem-solving approach in industrial arts involves creative thinking and gives the student opportunity to apply principles of planning and design. Construction techniques, industrial processes, scientific principles, and mathematical computations are applied to the solution of problems.

5. *To develop skill in the safe use of tools and machines.* Industrial arts provides planning, construction, and production activities which enable students to acquire industrial-technical skill. These activities offer opportunities to develop tool and machine skills commensurate with the mental and physical maturity of the student.

Symposium J

EARL E. SMITH

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Teacher eduation can, and must, contribute to the implementation of frontier ideas in industrial arts. Modification in programs can occur at any level of industrial arts education, but for this change to become generally accepted and widely disseminated it must be supported through teacher preparation.

It is necessary that teacher education programs be innovative yet retain a blending of the traditional and the experimental. The university curriculum has always changed slowly. This can be a steadying influence admidst the wealth of proposals now being advanced or it can, through resistance to change, become a very real hazard to the future of industrial arts education. It is now obvious that we should move rapidly, but with care, to improve the contributions of industrial arts. We face a future that will require flexible programs that can function in a constant state of transition which parallels that of our evolving industrial society.

The increasing numbers of proposals, innovative curriculum recommendations, and pilot programs indicate that teachers are willing to take part in the developing and implementing of frontier ideas. This, I believe, presents reason for an optimistic view of the future of industrial arts education. The key to a thriving, challenging program is a competent teacher who is receptive to creative and constructive curriculum innovation. This also implies a major role for teacher education as it influences curriculum development through its preservice and inservice programs for teachers.

Frontier ideas as expressed by Dr. Ralph W. Tyler will require an industrial arts teacher who can make a wide range of contributions to the general and specialized educational development of his students. To achieve this goal the teacher must receive a strong technical orientation and also be prepared as a generalist who is knowledgeable in the basic academic disciplines. He must learn how to organize educational activities that jointly serve with other fields in reaching new educational goals. This expectation will necessitate the strengthening and further integration of all aspects of teacher preparation, through restructuring of existing courses and course content to form new instructional relationships.

The increasing focus upon the development of ability to meet new situations and to solve problems creatively makes it necessary for all teachers to increase their understanding of the learner and the learning process. We will need to improve the integration of understandings and concepts from the humanities and behavioral sciences with those of the professional major. The expectations for interpretative, creative industrial arts instruction will draw heavily on teacher understanding of disciplines such as psychology, sociology, and economics. The preparation program must also provide the potential teacher with opportunities for developing insights and understanding that parallel the nature of those he will expect his students to achieve.

Technical subjects and the instructional organization must reflect a closer correlation between what is done in our industrial society and the experiences expected of potential teachers. Frontier ideas and emerging curriculum patterns require that the teachers recognize industrial arts as a field of application, and as such, it should make use of student knowledge and understanding from all subjects. To prepare teachers for this flexible type of program requires that they learn and be capable of creatively teaching new concepts of industry and technology. Their technical preparation must include broad experiences and applications that reflect and interpret technology, and focus upon problems of industry, the individual, and his role as he participates in an industrial society.

Teacher education programs will need to offer special opportunities for the inservice teacher to study and experience similar activities through workshops, seminars, and inservice programs.

To meet the challenge of frontier ideas all teachers must see themselves as innovators and implementers of sound educational concepts, whether these concepts are based on the traditional patterns or on frontier ideas. ■

FRANK A. BRADBURY

Balboa High School
San Francisco, California

"In the beginning God created Heaven and earth. . . . " Here we see our first worker. Our first industrial arts student. He used the materials at hand to create the earth and man. Man now follows in God's footsteps in using the materials at hand which are useless to him in the form in which they exist and changes that form so that it is useful to man.

In our search for more, better, and faster ways to create new and better products for man, we have saddled our educational system with a pack of historical facts from the past as well as from the present. The pack becomes so heavy to some that they fail in the effort to keep up with their contemporaries. Dr. Ralph W. Tyler states that 20 percent of our children do not reach more than second grade level reading ability by the time they leave school. If the pack is heavy for educators, how heavy it must seem to a teen-age student reading at the second grade level. "I'm stupid," a student stated to me when I asked why he was getting such low grades in school. What horrible accumulation of failure in academic pursuits has given him the conviction he is stupid? Must we continue to give one out of five students a defeatist attitude?

We use our collective knowledge today to create the highest standard of living known to man. We create fantastic electronic devices for lightening man's load of physical or mental labor. In spite of this, we fail to teach one out of five to read beyond the second grade level.

Any new frontier that we may dream up must be implemented by each teacher, supervisor, and teacher educator, if we are to lighten the load we are carrying today.

Christopher Jencks in the April 23, 1966, issue of *Saturday Evening Post* has an article entitled, "The Public Schools Are Failing" and he suggests that private schools be established in slum or culturally deprived areas as a solution, private enterprise to take over where public ownership has failed. Private enterprise has made it possible for only 45 percent of our population to support the other 55 percent in the fields of production, distribution, sale and advertising of material goods.

It would seem that any institution as suggested by Dr. Tyler would be worthy of consideration to lift the veil of ignorance from those being defeated by our educational system. ■

ROBERT G. HOSTETTER

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Millersville, Pennsylvania

This is the age of evaluation; everything is being evaluated—everybody is being evaluated. How about industrial arts? Have we been too near the forest to notice the trees? Being chiefly concerned with the material needs of man, it is quite possible to forget his non-material side. Our non-material needs become more prominent as automation plays a more important role in the production of goods. The whole structure of our industrial organization has changed. Is our program of learning situations really geared to mesh with this change?

Robert Theobold in the March, 1966, issue of the *National Education Association Journal* stated the fact that "all knowledge is related; specialized knowledge can only be communicated in a context of general knowledge." Is the content which we teach in industrial arts such that it has vital meanthing to our students in the context of general knowledge? No one will question the relative importance of our area of work in present day technological society. Should we examine the methodology which we have employed in presenting our subject? Looking at the findings of leaders in education, it is evident that the ultimate goal for the children in a democracy is the maximum development of each individual child. Educators also gree that the progression in the process proceeds from experience of a concrete nature to the more abstract modes of thought. Bruner in *The Process of Education* said that "concrete activity that becomes increasingly formal is what leads the child to the kind of mental mobility that approaches naturally reversible operations of mathematics and logic." Both Piaget and Dewey recognize the value of experiencing with materials as an aid in learning.

Since experience is so important in basic education for children, does it not seem logical that laboratory work should aid substantially in learning at the secondary school level? The frontier that I present is that which concerns *implementation which will bring industrial arts into a more vital relationship with other school subjects.* A laboratory course, as any other course, is no longer considered worthwhile unless it can make a contribution to the total learning experience. A third dimension is added to learning when laboratory work is properly related to school subjects. The frontier to be pushed forward, then, is that which concerns the relationship between our field and the other fields of learning. We can advance on this frontier if we give more careful consideration to the developmental needs of the student while we advance toward the over-all goal of the school.

It is generally agreed that there is a natural interest in the activity that is provided by work in industrial arts. The weakness seems to lie in our inability to gear our program to other school subjects in furthering the over-all aims of education. Administrators are constantly appraising the contribution we are making to the total school program for *all* students. Would it not be better if we would engage the learner in the actual experience of *making* and *using* more than we presently do? Construction can serve to confirm the laws of physics, show the great achievements of the various periods in history, illustrate the workings of one of the new space vehicles, or demonstrate how sound vibrations are produced in the standard musical instruments. Procedures involved in such activities become a vital part of independent study that is being used in many schools today.

We cannot afford to spend the time in making projects which offer the learners experiences which are meaningless. It is becoming more evident that no subjct is important enough *in itself to justify* a place in the curriculum. One is not a "literate" member of today's society if he lacks the knowledge and understanding of the technological implications that make our way of life possible. Our industrial arts programs should contribute a wide spread of knowledge to show the fundamental structure of technology.

Elementary teachers have demonstrated the ability to utilize construction activity as a method of giving greater meaning to the whole school program. Perhaps more construction-type activities could be used to enrich the program beyond the elementary level. We have an excellent opportunity to inter-relate industrial arts with the other offerings in the curriculum. This frontier seems to deserve our best effort, for we see much valuable learning possible when we move into this new territory.

Symposium K

JAMES BEACH

Lowell High School
LaHabra, California

The drawing appeal of technology cannot be questioned. A vast majority of our high school students will work in one phase of industry or another. Yet our schools still seem to be academically oriented. A strong, meaningful, realistic industrial education program is a necessity.

Our education system is having a hard time providing the high level of education needed by our students who are entering the world of work. New methods of presenting new information to students must be developed and must be *used*. We talk about the various modern methods (closed-circuit television, large group instruction, team teaching, etc.). Let's quit talking and start doing.

The emphasis is on how to learn, not what to learn. Industrial arts education is in an excellent position to provide for this. A problem-solving approach taking the problem through the various steps, concluding with the development and construction of the solution, would be a start in this direction. The IR&D approach (industrial research and development) is also a desirable one.

Industrial arts education can provide a situation where a student learns *how* something happens, then learning *why* will be much more meaningful. Care must be taken to avoid a lecture situation when a lab situation would be more advantageous and meaningful to the student. ■

JAMES O. GILLILAN

Consultant of Industrias Arts, St. Louis Public Schools
St. Louis, Missouri

It is likely we will continue to have differentiation in ability of people to do work, from now on to eternity. This is not new. It is a problem that has been with man from the beginning. We are driven to give serious attention always for those that can do profitable work. But serious concern too must be given for those who cannot do profitable work. To forget about one for the other could destroy our democratic way of life.

All of us have seen much change in the years that we have lived. Perhaps those of my generation have seen more change than any other. What has this meant? First, it has caused each new day to present problems—some old, some new; problems that man has tried to solve for many years without apparent success and other problems that are completely new, needing quick solutions. What a challenge this is for those accepting the responsibility to help educate the youth of today for the tasks of tomorrow.

If we were more confident of what tomorrow will be like, the frontier it promises would be easier to enter. The exodus of people from rural to urban areas has thrust many problems on both. Educationally, how do you stabilize good, sound education for people who migrate often? This, it seems, is one of the big frontiers today. Getting to know and understand this complex frontier is a most difficult problem.

Perhaps those of us who have lived in the country during our youth, and have since moved to an urban area to make our livelihood, see more clearly what is happening than those who have remained in the same place. Experiences that I had on the farm were so different to those of city youth, both then and now. How we equalize these advantages or disadvantages is a moot question. Technology places many demands on education along with new oportunities for young people. Our schools must serve the American people better in meeting these needs.

The change in occupational distribution has changed greatly in the past 75 years. Today, only about 20 percent of the population engage in agriculture and unskilled labor. The rapid reduction in the demand for unskilled labor makes the need for advanced occupational training essential if the members of our new labor force are to be productively engaged. The federally-supported programs have made pilot projects possible for many school systems. The newness of this opportunity compared with the unpreparedness of educators to act quickly toward implementing programs has been noticeable. This is a new frontier for many, and certainly one for industrial arts.

The St. Louis schools have several projects that are federally supported. Some of them are:

1. "Operation Dine-Out." This is a program designed to give upper-grade elementary children who had never eaten a meal in a restaurant the opportunity to do so. The preparation for this experience includes: Appropriate grooming, cost, selection of food and place to eat, sharing public places with others, transportation, communication, etiquette, etc. This has proven to be a very helpful educational experience for these children—a new frontier for them and for their community. It was so successful that they followed with a second project called "Operation Cafeteria."

2. Another is after-school and Saturday morning craft classes taught in the industrial arts shop by a regular classroom teacher who is also a certified industrial arts teacher. One interesting development in this particular project was the large number of pupils who went almost voluntarily to the public library to do reading about industry and industrial arts subjects.

3. A new frontier project we are planning for the Laclede-Chouteau Summer Institute Project during the summer of 1966 is a course in creative industrial arts for capable achievers in the secondary school. These students are not achieving up to their level. In this course the student will choose one of four areas which interests him. Encouragement will be given the student to use his ability and initiative. The project is for 7 weeks.

4. The acute shortage of qualified industrial arts teachers is a serious problem for most school systems, and our excellent teacher-training institutions at present cannot train teachers fast enough to meet the need. Without strong, well-trained teachers to carry on the work, industrial arts course offerings cannot move forward as they should. Yet, we need not wait! Would it not be feasible to utilize laboratory facilities in our large city high schools to offer teacher-preparatory courses for elementary industrial arts teachers? Some means could be worked out to get a qualified staff. Credit for the courses offered could be granted by a college or university, possibly in the same city. There is a good chance federal assistance would be available for a project of this kind. This is an idea

that may be helpful to many of us.

Along with the idea of teacher training would be the possibility for good in-service training courses that could be geared to the changes we need to make. Some of the changes are long overdue. It would certainly help teachers to have the opportunity for learning new ways and processes. Change would receive more consideration than it is now getting.

5. Another far-reaching project has just been approved by the St. Louis Board of Education to go into effect this summer: Students in the St. Louis Public Schools are being "served notice" that they must attain certain levels of academic competence and attend classes regularly if they expect to be graduated.

Remedial Program

New requirements on academic achievement first will be brought to bear on the students at the end of the eighth grade, when they are tested for track placement in the freshman year or ninth grade. If they are lagging to the extent of 25 months of achievement in reading and arithmetic, they will be scheduled for a ninth grade remedial program.

The pupils and their parents will be informed by school officials of the deficiencies.

The students will be eligible for enrollment in a six-week tuition-free summer school in reading and arithmetic. If the pupils attend and demonstrate a five-month gain in achievement, they will be enrolled in high school as students in the track for which they qualify.

Those who do not show the necessary improvement and those who do not attend the summer school session will have the choice of enrolling at an "opportunity" school or in high school as a remedial student. The opportunity school program will provide special teaching in an attempt to restore the student to regular high school enrollment.

20-Member Classes

Students who choose to enroll in high schools for remedial instruction will be assigned to classes of 20 students per teacher. They will receive one period each of reading, spelling and writing, arithmetic, practical arts, and physical education. They will later be enrolled in regular classes if they reduce their achievement lag by five months.

If they do not make progress, they again will be eligible for enrollment in the tuition-free summer session. At the end of the summer session they again will be tested, but will not be eligible for further attendance in high school if they have not shown required improvement. However, they will be eligible for enrollment in the opportunity school for specially designed educational programs.

Other basic achievement tests will be administered to freshmen completing the ninth grade, beginning in the 1966-1967 school year. Students presently enrolled in high school will not be tested. Those making passing scores will be academically certified and will have no other special requirements imposed beyond regular classroom work.

Students who fail will be encouraged to enroll in the summer program. If a student has not made required test scores by the beginning of the senior year, he may enroll in the opportunity school and receive a special diploma upon completion of the program.

If the student chooses to remain in the regular high school, he will not receive a regular diploma if he has not scored minimal levels of achievement to be established, but will be eligible only for a certificate of attendance. The Division of Pupil Personnel Services will work with a commercial testing company to define test specifications and establish passing scores. The tests will be based on a minimum core of fundamental concepts in each of the basic academic skills.

Through the plan described, hope is held that we can reach students who have not responded to current opportunities provided by the schools. Industrial arts courses are being designed to fit the curriculum changes that will be necessary to help these students to achieve, with a maximum of 12 students in an industrial arts class. ■

DANIEL L. HOUSEHOLDER

Purdue University
Lafayette, Indiana

As industrial arts education looks to the future, there is no doubt that we are facing a frontier. Change in our society has accelerated at such a pace that even we in industrial arts can no longer ignore it. The challenge of the frontier is not, however, to catch up by gearing our programs to the present; it is the challenge to develop an appropriate industrial arts education program for the future. Frontiers are never comfortable places designed for relaxed living. Rather, they are characterized by an intense atmosphere of exploration—the exciting search for the keys to further development—which affects virtually every individual at the frontier. While there seems to be a contemporary tendency to view a frontier as a barrier to progress, we should be especially aware of the diversity of opportunities which are available to us at the frontier, and make every effort to capitalize upon these opportunities.

When we look to the future, there are few guidelines which will help us decide what future citizens and their teachers will need to know, but there is every indication that they will need to acquire an enormous amount of information during their lifetimes. Obviously, we should be more concerned with the development of the *ability to learn* than with the specific material which is to be learned. In short, we must cease to view man as a container for knowledge and skills; our educational endeavors should be pointed toward the development of man, *the information processor*. While this point of view includes such methodological approaches as research and development, creativity training, and problem-solving, it transcends specific methods of teaching to become a pervasive point of view guiding the entire educatonal process.

A flexible approach to curriculum development and institutional organization is definitely implied. As the demands of society upon the educational enterprise change, the schools must become more adaptable. However, this is only a partial solution at best, since adaptation occurs only after the environment itself has changed. It may be that the present is the best predictor of the future; on the other hand, such attributes as receptiveness to new ideas, mental flexibility, and the ability to think creatively, logically, analytically, and quantitatively may tend to transcend the limitations of a specific time and place in our development. We must be perceptive of the directions of trends, yet maintain a vigil to identify any universals which may exist.

We at Purdue are especially proud of the ways in which our institution had adapted to social and technological change. In our School of Technology, new curricula appear rapidly in response to industrial and social needs. Yet, the production of graduates lags far behind the appearance of the need for them. All of us recognize that industrial arts teacher education cannot hope to provide all the competencies teachers will need during their professional careers; we must assist them in the development of the abilities they will need to succeed at the frontier.

At the present time, it is frequently noted that individuals in our society need to be prepared for more intelligent use of their leisure time, for increased understanding of human relationships, and even for the creation of their own industries. These are contemporary needs; important, but perhaps no more important than others which may be mentioned. Unprecedented new demands may appear before our current crop of students assume their adult roles—only by providing the ultimate in the development of human potential may we hope to prepare our students for life beyond the frontier.

It is imperative that we move at once toward a program which will improve each individual's potential for meeting challenges and opportunities which are his to meet among and beyond frontiers which cannot be visualized today.

■

EDWARD BRATSET

Assistant Dean Trade Technical Education, Laney College
Oakland, California

The industrial arts programs in the high schools and colleges must have innovative ideas to assist in bringing more attention to a very valuable part of our American education. The industrial arts program must have new ideas because the present program is in serious competition with the liberal arts, science, and engineering educational offerings. The I-A program needs new ideas to attract students into I-A programs in four-year colleges and in high schools.

One such idea is the program now being conducted at the San Francisco State College in the Industrial Arts Department. The program is designed to provide a bachelor's degree for students who could go to work in industry. The Design Arts and Industries program at San Francisco State is tailored for individual students who have completed 60 units at a junior college or for students who do not have a major. The program is interdisciplinary in nature with ten units required in the D-A-I field. Five of the ten units are in product and design, and five units are in visual communication. The D-A-I block of two courses has been developed to orient students to various industries, help select particular interests, understand broad scope, avail diversified procedures, analyze processes, establish research attitude, sort criteria, classify ideas, verify findings, and present a logical and visual exhibit.

One of the criteria for industrial arts programs is that they are closely associated with industry. Why couldn't a program patterned after this one be started in the high school? It seems logical that the curious mind of youth would be challenged by such an intriguing subject.

A further need has been noted in the field for instructors able to keep up with the industry. It is well known that many high school and industrial arts instructors do not know what is happening in the way of new industrial developments in their respective fields.

As an example, many high school electronics instructors do not know the slightest thing about transistors—in fact, some instructors say that transistors are only a passing fancy. One has only to talk to people in the electronics industry to find out that vacuum tubes and the soldering of wires has given way to transistors and printed circuits. What can be done as a solution for this problem? I would suggest that a program could be started whereby instructors could swap their teaching assignments for one year with workers in a like craft in industry. Admittedly there would be a great number of problems to straighten out such as tenure, retirement contributions and many others, but I am sure that the advantages would far outweigh the disadvantages.

It seems that the state colleges in their training of industrial arts instructors should be the leaders in teacher training because these instructors go into the high schools and teach old subject matter if they have not been brought up to date with new industrial materials and processes. Therefore the going-back-to-industry idea must start in the four-year college.

Another innovation that could be used in the industrial arts field is the use of advisory committees. The advisory committee system is being used very effectively in occupational education programs in the junior colleges. When a new product or a new material is introduced into industry, the advisory committee automatically asks the college to change the curriculum to include the new material or process. ■

PROFESSOR RICHARD D. KAIN

Chairman, Department of Industrial Arts, Ohio Northern University
Ada, Ohio

Foremost among the frontiers of teacher education is the challenge of improving our college programs to accommodate a change from the "trades skill-oriented" approach to an "understanding of industry and technology" approach. There is an obvious discrepancy existing between what a high school industrial arts teacher is accomplishing with his classes and students, and what he relates as his objectives. Very often one hears a teacher say without hesitation that the primary objective of his program is to provide an understanding of industry and technology, while at the same time his curriculum may consist of two or three major areas of instruction—drawing, woodworking, and general metalwork. It would appear that a prospective teacher who has been introduced to the correct approach while in college will be less likely to teach manual training-type skills that were popular in our public schools long before Sputnik or the Gemini space program.

If a college background could provide to potential teachers experience of a relevancy comparable to that which is expected of an industrial arts teacher in the public schools, the teacher in turn would be better equipped to establish leadership in upgrading curriculums to become more representative of professional objectives.

Departmental programs on the college level can make definite changes to include such curriculum areas as manufacturing processes, construction, power and transportation, electricity and electronics, industrial organization, industrial materials and production, and perhaps other major areas, each of which may be subdivided into logically organized courses at the baccalaureate level.

During the four years that the future industrial arts teacher is in college, every effort should be made to acquaint him with industry and technology through laboratory work, experiments, or activities demonstrating the development and manufacture of products through industrial practices and methods. He should become familiar with a wide variety of industries through visitations or field trips and personal contacts with men from industry who may impart to him knowledge of personnel work, labor problems, occupational information, skill requirements, organizational patterns, safety practices, and research and development procedures. Greater use should be made of the industrial films and other visual materials that are available at low cost. Many of these resources have direct application to an understanding of industry and technical fields. Many aids are available to complement practices, promoting more efficient skill developments in the basic manipulative areas.

Industrial exhibitions and museums of science and technology offer valuable resources for the industrial arts teacher education program, and these facilities are usually within easy access of most institutions of higher education. Many valuable contacts can be made in this regard, contacts that benefit not only the student, but the college industrial arts program as well.

While proposing more emphasis on an understanding of industry and technology, let it not be implied that all traditional practices be thrown out. It still is necessary that certain basic skills be taught, but to this point it should be suggested that there be less emphasis placed on the traditional project—the footstool, the coffee table, the necktie rack, etc. Instead, we must be willing to regard the project for what it really was meant to be—a vehicle to learning—not an end in itself. The development of an assembly line, the automatic control of a machine, or an experiment with a construction material or a new material, could for all practical purposes be considered a project. Let us be concerned here also with design and give more attention to design theory and fundamentals. With the materials and resources at our disposal it is imperative that we prepare our teachers to be more alert to this important element in the world of technology. The many facets of a knowledge of design have significant influence on manufacture, production, advertising and sales, all of which relate to both aesthetic and technical values.

Many of our industrial arts teacher education programs could do more to provide for continuing education through the establishment of summer workshops, promotion of in-service education, and follow-up procedures for new teachers. These efforts can present opportunities for teachers to keep abreast of new developments and assist them in improving instruction in schools within the area of influence of the university. This procedure is not uncommon in the sciences. Perhaps we in industrial arts could benefit by their example.

Much of the research that has been completed in the field of industrial arts is not being given attention or implemented to the extent that it should. There is value in much of this research and it behooves us to become more alert to its message. The infusion of applicable research data to our curriculums, courses, teaching methods and techniques could provide improvements, offering a more realistic and efficient approach to the study of industry and technology.

There are other important frontiers to be explored in considering the enrichment and advancement of industrial arts teacher education. Some of these are: Improvements in instructing *how* to teach, development of student teaching internships, design of facilities for the future, organization of a national curriculum, development of programs of public relations to enhance our professional image, preparation of teachers for the gifted, physically handicapped and slow learners. There remains, also, the perennial problem of recruitment of students who may become teachers in our field so that it may be properly propagated to meet ever-increasing demands of the public schools and colleges.

These frontiers (or call them problems) and those discussed earlier in this report, elicit the concern of each of us involved in the profession of preparing industrial arts teachers for tomorrow. We would do well to assume seriously our responsibility. We must possess the vision and resourcefulness to accommodate every means available in attempting to achieve our ideals and objectives. ■

A Study of Eye Protection in a High School's Industrial Arts and Chemistry Departments

DEE K. NIELSON

Chairman, Industrial Arts Department, West High School

Salt Lake City, Utah

It might be appropriate at this time to fill you in with a little information about West High School, where this study was conducted. West is one of four high schools of comparable size in Salt Lake City. It has a student body of approximately 2200 and a faculty of about 90 teachers. Our industrial arts department includes seven industrial arts teachers teaching woodshop, machine shop, metal fabricating, electricity, technical drawing, and two auto shops.

At the beginning of the 1964-65 school year, West High School was selected to conduct a pilot study in the use of eye protection in the industrial arts and chemistry departments. Through the efforts of Fred J. Whitney, Executive Director, Utah Society for the Prevention of Blindness, financial assistance was obtained from the State Department of Public Health for the purchase of all necessary equipment and supplies.

Plastic all-purpose chemical goggles were purchased for those students enrolled in chemistry as well as those students wearing prescription type glasses. Plano spectacle-type glasses were provided for all other students enrolled in industrial arts classes. In addition to the glasses and goggles purchased, auxiliary equipment and supplies were needed, such as lens cleaning stations, lens cleaning solution, an optical repair kit, and the installation of an eyewash fountain in the Technical Building.

Initial cost of the plano glasses was $2.53 per pair, and $1.20 per pair for the plastic goggles. Approximately 910 students or about 41 per cent of the student body was involved in the eye safety program, bringing the total cost of the program, including equipment, supplies, and parts, to $2,369.39.

In view of the fact that the eye safety program at West was to be a pilot program, I felt this would be a good opportunity to collect information and data on the subject of eye safety to be included in my master's thesis. It was my intention that this information might be helpful in initiating other eye safety programs. The purpose of my study was to:

1. Obtain students' reaction to the wearing of safety glasses and goggles.
2. Obtain teacher's reactions to the wearing of safety glasses and goggles.
3. Determine if eye protection is necessary in all areas of industrial arts. arts.
4. Determine whether eye protection should be worn at all times when working or observing in the industrial arts shops or chemistry department.
5. What are the trends in industry toward eye protection?
6. Reaction of industry toward a school eye safety program.
7. Determine the problems encountered in initiating an eye safety program.

To obtain information concerning student reaction in the use of eye protection, a questionnaire was given to the students involved in the program. Of the 910 students involved, 576 or 63 per cent completed and returned the questionnaire. The questionnaire was designed to give positive and negative responses and multiple-choice answers.

Some typical questions included were:

1. Do you feel it is a good policy to wear safety glasses or goggles while working in shops or the chemistry laboratory?
2. Does the wearing of safety glasses or goggles cause you any discomfort? If so, what part or parts cause the most discomfort?
3. Do the glasses or goggles distort your vision?
4. Do you believe that safety glasses or goggles should be worn 100 per cent of the time while working in the shops or laboratory?
5. Has there been any incident in the shops and chemistry laboratory where you or someone else may have received eye injury had safety glasses or goggles not been worn?

As a result of this study, the following conclusions have been made: A majority of the students and teachers involved in this study indicated that they were in favor of eye protection and wanted to see the eye safety program continued. The chemistry department in particular showed an extremely favorable attitude toward the wearing of eye protection. One might conclude from this that these students had been made more aware of the potential hazards of eye injury in this area. Results of the questionnaire and personal observation seemed to indicate that the attitude of the students toward the wearing of safety glasses or goggles, whether it be positive or negative, was determined to a great extent by the philosophy and attitude of the individual teacher administering the program.

It can be concluded that some areas of industrial arts are more conducive to eye injury than others. Students enrolled in auto mechanics and electricity felt that there was less need for eye protection in these areas, due to the nature of the course, whereas students enrolled in machine shop, woodwork and metal fabricating felt a greater need for eye protection.

In reference to the fit of the glasses and goggles, it was concluded that the side shields and cable temples caused a certain amount of discomfort and that the side shields reduced peripheral vision.

It can be concluded that through the use of safety glasses and goggles vision distortion did occur, but in most cases only when they became dirty. Both the plano glasses and the plastic goggles fog up under certain conditions and the main reason for this is due to the lack of sufficient air circulation around the glasses and goggles.

From the results of contacts made with industry, it was concluded that there is an increase in the use of eye protection and that they believe that 100 per cent eye protection in the schools is a good policy, both morally and economically.

Based on the findings and conclusions of this study, the following recommendations have been made:

1. Students should be throughly oriented prior to initiating an eye safety program. This can best be accomplished through small group orientation.
2. Safety glasses and goggles should be issued to each student in all shop or laboratory classes.
3. Special storage cabinets should be provided in each shop or laboratory area for storing glasses or goggles when not in use.
4. Safety glasses and goggles that afford ample air circulation should be provided.
5. Safety glasses with side shields and temples designed to be worn with minimum discomfort should be provided.
6. Lens cleaning solution to inhibit fogging should be provided.

7. Glasses and goggles should be made available to the students on a low rental basis.
8. Impact goggles in place of chemical goggles should be issued to those students wearing prescription glasses in the shop area.
9. Adequate visual aid material, such as safety posters, slogans and charts should be provided and displayed conspicuously in all areas where the glasses or goggles are to be worn.

Value of Eye Protection Program

As to the value of the eye safety program at West High, this can be best answered by the response given to the question, "Has there been any incident in the shop or laboratory where you or someone else might have received eye injuries, had safety glasses or goggles not been worn?" A total of 106 students indicated *yes* to this question, including students from all shops and the chemistry laboratory. A number of these reports represented the same incident, but nevertheless, this is a significant number and does show a definite value to the eye safety program.

Investigation made during this study and since, shows that 22 states have passed mandatory eye safety legislation. ■

Summary of Executive Board Meeting

The Executive Board of the American Industrial Arts Association met in official session April 18 and 19, 1966, in California, and took the following official actions:

1. *Developed* the policy of holding summer executive board meetings adjacent to forthcoming convention sites.
2. *Reported* on a very successful 28th annual convention which broke several records, including having 140 commercial exhibits.
3. *Announced* that 39 states had selected outstanding teachers to be honored by the AIAA.
4. *Reported* a financial balance, on March 31, 1966, of $49,771.75.
5. *Announced* the receipt of a grant from the American Hardboard Association of $10,890.00.
6. *Announced* the appointment of Miss Betty MacDonnell as managing editor of *The JOURNAL of INDUSTRIAL ARTS EDUCATION.*
7. *Reported* an average of 706 pieces of mail a day being distributed from the AIAA national office. This number does not include bulk mailings, such as the *JOURNAL,* the educational packet, form letters to membership, etc.
8. *Approved* a life membership pin designed for the association.
9. *Agreed* to discuss the advisability of investing AIAA reserve funds in NEA mutual funds or other sources after the summer executive board meeting.
10. *Approved* a policy statement developing safeguards for the association's position as a 501(c)3 classification by the Internal Revenue Service.
11. *Approved* a policy statement for a member's privileges to run a full year concurrent with the dues payment of each member, following receipt of the said dues in the national office.
12. *Approved* the policy of providing individual membership for individuals working with companies holding sustaining membership in the AIAA.
13. *Agreed* to discuss placing executive board travel on a per diem basis.

14. *Approved* the affiliation of the New York State Industrial Arts Association, the North Central Industrial Arts Association of Ohio, and the Nova Scotia Industrial Arts Association.

15. *Heard* a proposal from the Encyclopaedia Britannica offering to make the encyclopaedia available to AIAA members at a special price through a special mailing on association letterhead.

16. *Agreed* that the dates for the 1967 convention should be March 13-18, and the theme should be "Industrial Arts and Technology—Past, Present and Future."

17. *Received* a report from the *ad hoc* study committee concerning AIAA operations and developments.

18. *Approved* recommendations from Sections 1, 2 and 3 of the report.

19. *Approved* a request to repay the $14,000 borrowed from the National Education Association in establishing *The JOURNAL of INDUSTRIAL ARTS EDUCATION*.

20. *Agreed* that any policy of placing five percent of the budget of the AIAA in the reserve fund be discontinued.

21. *Approved* a proposal for providing a seal for AIAA sustaining members.

22. *Received* a request from an apron company to print the club seal on its aprons and requested the club's director to check into insignia on aprons and present its findings to the board at the summer meeting.

23. *Received* a report from the chairman of the AIAA-National Safety Council Joint Committee concerning a proposed book on safety in industrial arts.

24. *Received* an invitation from the Adolphus Hotel in Dallas for holding a future convention in Dallas, Texas.

25. *Scheduled* time at the summer board meeting for considering a name change for industrial arts.

26. *Agreed* to discuss the development of a loyalty fund for the association at the summer executive board meeting.

27. *Approved* the plan of inviting industries to support a 16-page insert in the *NEA JOURNAL* on industrial arts education.

28. *Agreed* to hold the summer executive board meeting at Millersville State College on July 29, 30, and 31, 1966.

29. *Approved* an in-hospital indemnity insurance plan for the association.

30. *Approved* a proposal for the American Industrial Arts Association to make application to become a member of the World Confederation of Organizations of the Teaching Profession.

31. *Approved* salary adjustments for the professional staff with commendation for outstanding service in the national office.

32. *Received* the resignation of the Executive Secretary.

33. *Declined* to accept the resignation of the Executive Secretary. ■

1966 Report to Members

Each year at the annual business meeting the President of the Association is given the privilege of reporting to the membership on the affairs, and achievements of the Association.

Quite obviously it would be impossible to review for you in detail all of the activities of the Association during the past year. Nor should such a detailed review be necessary because many of the affairs of the Association are reported to you regularly in *The JOURNAL of INDUSTRIAL ARTS EDUCATION* and other mailings which are sent to the membership.

This report will have two main purposes: first, to review the highlights of the past year; and second, to present very briefly a summary of the progress made by the association during the past five years.

Realizing that one of the major shortcomings of our profession is, and has been, good public relations, your Association took some definite steps during the past year to improve this situation. Allow me to cite a few examples.

1. On October 17, 1965, a national radio network, the program "What's the Issue?" featured industrial arts education. On this half-hour program your president and the executive secretary, Dr. Dawson, were interviewed by John Harmon, Public Rlations Director for the United States Chamber of Commerce. The content had to do with the basic purposes and scope of industrial arts education. The response to this program indicates that it was well received by the listening public. Incidentally, tapes of this broadcast are available.

2. A second move in this same direction was the organization of a speakers' bureau for industrial arts. A list of names of informed and capable speakers from all parts of the country is being compiled. When requests come ot our national office for speakers at local, state, and regional meetings for industrial arts, these requests are being filled by someone from that general geographic area. This program was inaugurated on a limited scale during the past year and met with such success that plans are being made to expand this service to the profession.

3. Another major achievement in our public relations effort occurred when the United States Chamber of Commerce published a four-page supplement on industrial arts in its Washington Report. Over 200,000 copies of this report were distributed throughout the United States.

4. Also, a significant achievement in furthering our public relations took place when the National Education Association printed and distributed 150,000 copies of the brochure, *"Why Your Child Needs Industrial Arts."*

5. Finally, in this connection, I would like to mention the very excellent work done on our magazine, *The JOURNAL OF INDUSTRIAL ARTS EDUCATION*. Last summer in New York City the Educational Press Association awarded a First Place in its annual competition to our *JOURNAL.*

Legislative Breakthrough

The past year will be long remembered as the year in which industrial arts made a real and very significant breakthrough in its legislative program. I am referring, of course, to the amendment to include industrial arts in Title XI of the National Defense Education Act. This piece of legislation will provide funds for the summer of 1967 for industrial arts. As you know, a limited funding provided for *five* institutes to be institutes for teachers of industrial conducted during the summer of 1966. If we make intelligent use of the opportunity provided in this piece of legislation, the results should be very significant in upgrading the profession of industrial arts education.

In the area of legislative achievements it should also be mentioned that our national office conducted in January of this year a conference on Federal Aid for Industrial Arts. This was attended by over 100 industrial arts teachers, supervisors, and teacher educators from throughout the United tSates. At the banquet session on Tuesday evening of the conference, Dr. John Lumley, Director of NEA Legislative Commission, was the speaker and Senator Prouty, who introduced the amendment to include industrial arts, was given a plaque in recognition of this service to our profession. The enthusiastic response of those in attendance at this conference attested to its success. The results of the conference have been compiled and published in a book which is now available to the membership.

Work of the Committees

In any association of this kind success and progress are directly dependent on the work done by the special and standing committees. A complete report of all activities of the committees has been filed with President-Elect Dr. Woodward. I have extracted a few of the high points to share with you.

The membership committee under the direction of Harry Gunderson has organized the country into six regions for the purpose of membership promotion. A person from each of these regions has been named to serve as a kind of membership board. This board, working closely with the state representative from each state, is planning an improved and vigorous compaign to increase membership in the association (they need help from all). The legislative information committee chaired by John O. Conaway was kept especially busy this year. You are well aware of the manner in which they discharged a difficult assignment, in keeping us all informed on the progress of legislation for education.

The safety committee chaired by Denis Kigin was active on several fronts. Notable especially is activity in eye safety legislation and the outline of a book on safety in industrial arts which is planned for publication by the association.

Continuing with publications, the committee on publications under the direction of Neal Prichard has several new bulletins in preparation. The technical bookshelf which was authorized a year ago will become a reality soon with a booklet on "Fluidized Bed Coating" by Ron Koble. Another on Electronic Glueing is being prepared by John Chilson.

The student clubs program with Rex Miller as chairman reports that there are now 77 high school industrial art clubs with a total of 1702 members, representing 28 states, Canada and Guam. Vol. 1—No. 1 of the *AIAA Club News* was mailed to all members this spring.

The scholarship committee has proposed a study of scholarship programs with possible funding from industry. Dan Householder is chairman of the committee.

The research committee has identified five major problem areas need-

The research committee has identified five major problem areas needing attention and has named a coordinator for each of these areas. Norm Pendered is chairman.

The efforts of the public and professional relations committee have stimulated the writing of articles and the distribution of appropriate materials. Al Newton heads this committee.

The orientation meeting and the very pleasant reception for foreign visitors at this convention were the work of the international relations commitee under the direction of Dan Perry.

The teacher recognition committee headed by Sherwin Powell has done an outstanding job. The outstanding teacher awards program later at this session will be testimony to their efforts.

A special committee under the direction of Len Glismann has been established to assist the Educational Testing Service in Princeton, New Jersey, in the preparation of a test for industrial arts education.

Another special committee, the equipment standards committee chaired by Sam Porter, is nearing the completion of a very difficult assignment: The publication on equipment standards should be ready for presentation to the Board for action at the summer meeting.

National Office

In January of this year the Association marked the fifth anniversary of the establishment of a national office in Washington with a full-time executive secretary and staff. With this fact in mind, it seemed proper and desirable to assess our progress and study our achievements as well as our shortcomings during this initial five-year period. To accomplish this, a four-member *ad hoc* study committee was authorized.

Although the report of the committee is too lengthy to be read in its entirety, I would like to share some of the highlights with you.

1. Total paying membership has increased from 5,512 in March 1961 to 10,176 in June 1965. The percentage of increase is 187%; this in spite of the fact that dues were more than doubled during the same period.

2. Average convention attendance has increased from approximately 1,200 to an average near 2,000 during this five-year period.

3. Prior to 1961 the association held one convention, published 5 issues of the *Industrial Arts Teachers,* and several monographs each year. All work, including business affairs, was performed by officers, members of the Executive Board, or appointed committees. The association was represented at all special meetings by delegated personnel who were available upon request of the president of the association.

4. Since 1961 the national office has been responsible for the following:

   a. Assumed full responsibility for all administrative and financial details as prescribed by Constitution and Bylaws.
   b. Editing and management of all phases of all publications including *The JOURNAL of INDUSTRIAL ARTS EDUCATION.* This includes sale and distribution of 22 different publications and audiovisual tapes or films.
   c. Completely arranges for and administers the details for the annual convention in cooperation with the Executive Board and professional personnel.
   d. Travel to and participation in meetings throughout all 50 states which involves more than 60,000 miles per year.
   e. Establishing the insurance program, packet mailing service, and other direct teacher benefit programs.
   f. Maintaining an effective public relations and legislative program with United States Chamber of Commerce, legislative branches of the government, and other United States agencies. This has resulted in direct financial aid to and support for industrial arts.
   g. Maintaining a complete audiovisual resources pool available to the membership.
   h. Working toward securing and administering of industrial grant programs.

i. Working with personnel involved in sponsoring tours, clubs, recogtion programs.

5. The national office processes all memberships for AIAA and assists in same for its affiliated councils and/or organizations. This is done through use of Remington Rand system as presently used by NEA.

6. All mailings to membership including publications, packet service, dues, statements, balloting, and other services are processed directly by personnel in this office.

7. Actual editing of *The JOURNAL,* including solicitation of content material, advertising, and printing, are coordinated through office personnel.

8. All convention planning except the actual program development is assigned and administered by the professional staff.

9. Assuming total responsibility for representing and keeping membership informed (within limits of constitution) of all matters pertaining to legislation, professional and public relations, as they affect the AIAA and/or its affiliated councils or organizations.

10. Preparing for and keeping all records for the association including minutes or transcriptions of all meetings and/or activities.

Summary

1. The professional services rendered by AIAA professional staff to the membership exceed those of any other department of comparable size within a similar period.

2. The ability to achieve rapport with and receive recognition by governmental agencies in furthering the ideals and goals of industrial arts has not been surpassed by any other department in the NEA within the brief time our national office has been in existence.

While I in no way wish to detract from the excellent work being done by our several committees and other volunteers, it must be recognized that the achievements and growth I have enumerated are the results of having a strong staff in Washington, D. C. Our executive secretary, Dr. Kenneth Dawson, and his able assistant, Dr. Jack Simich, through their dedicated and untiring efforts have been responsible for much of the progress in our professional association. Let's show them our appreciation. ■

Annual Business Meeting—April 22, 1966

President Earl M. Weber called the meeting to order at 7:15 p.m. He introduced the parliamentarian, Ralph Bohn, California, hosts, and recorder, Jack Simich, AIAA staff.

The minutes of the previous meeting were read. Mr. William Wilkinson (Pennsylvania) moved to approve the minutes as read. Mr. Elmer Hemberger (Pennsylvania) seconded the motion and it carried.

The Executive Secretary-Treasurer presented the financial report. Dr. Ralph Gallington (Illinois) moved the report be approved. Dr. Willis Ray (Ohio) offered a second to the motion and it passed.

A general review of the rules of the delegate assembly was presented to the group by the Executive Secretary.

Dr. Weber presented the President's report. He reviewed the highlights for the past year and then recalled key accomplishments during the past five years. He indicated that the association concentrated heavily on public relations during the year. President Weber mentioned the national radio broadcast which featured industrial arts; the newly organized speakers bureau; Chamber of Commerce of the United States article which appeared in the Chamber's "Washington Report" and was distributed to 200,000 Chambers of Commerce throughout the U. S.; the publishing and distributing of 150,000 copies of "Why Your Child Needs Industrial Arts" by the National Education Association; and the mass coverage of information in the *Journal of Industrial Arts Education.*

Dr. Weber stated that this past year was historical in light of our first legislative achievement: The inclusion of industrial arts under Title XI of NDEA. He announced the publication by the AIAA of *Federal Aid for Industrial Arts,* which includes speeches made by specialists from the U. S. Office of Education and the National Education Association at the AIAA Legislative Conference, January 24-26, 1966.

Reports from various AIAA committees were presented to the membership by President Weber. He also gave a few of the highlights as reported by the Ad/Hoc Committee which studied the national office procedures.

The Executive Secretary introduced members of the AIAA staff.

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Old Business

President Weber reported to the membership that the Executive Board discussed the possibility of a teacher exchange program and indicated that further study would be made concerning this matter.

New Business

Mr. Sterling Peterson (Minnesota) stated that the Minnesota Association has recommended that institutes include technical courses in industrial arts.

Dr. Rex Miller, Chairman of the AIAA Student Clubs Committee, presented industrial arts pins to the national student club officers.

Dr. Robert Swanson, Chairman of the Committee on Resolutions, presented the report of the committee. Each resolution was acted upon and accepted as presented. Dr. Willis Ray (Ohio) asked for clarification of the resolution supporting the establishment of an Educational Research Information Center (ERIC). The Executive Secretary discussed the invitation received from the U. S. Office of Education to consider establishment of a center for industrial arts. He stated that this would involve the association and an institution for higher learning.

Dr. Kenneth Schank (Wisconsin) inquired about executive board minutes concerning affiliation of State Association Officers. The minutes were read. Dr. Schank moved to ammend resolution number four, which recognized groups affiliating with AIAA, to include State Association Officers. The motion was seconded by Mr. Stanley Sweet (Florida). The motion passed.

The Executive Secretary introduced the guest speaker, Dr. Richard Clowes, Superintendent, Burbank Unified School District, Burbank, California. Dr. Clowes' remarks were related to the men being honored as outstanding teachers. Mr. Sherwin Powell, Vice President for Classroom Teachers, reviewed the Outstanding Teacher Award program. Dr. Clowes and Mr. Powell, assisted by President Weber and President-Elect Dr. Robert Woodward, presented the plaques to the outstanding teachers.

The meeting was adjourned at 9:15 p.m.

Respectfully submitted,
Kenneth E. Dawson
Executive Secretary
AIAA

RESOLUTIONS ADOPTED BY THE DELEGATE ASSEMBLY

1. *Appreciation of the President*

WHEREAS, Dr. Earl Weber has given freely of his time and has been vigorous in his leadership as President of the American Industrial Arts Association, and

WHEREAS, the American Industrial Arts Association has experienced significant progress under his guidance and direction,

THEREFORE, BE IT RESOLVED, that the officers, the Executive Board, and the members of the American Industrial Arts Association express sincere appreciation for his outstanding service as President of the Association during the year, 1965-66.

2. *Appreciation to Program Participants*

WHEREAS, the American Industrial Arts Association is deeply indebted to many of its members for their untiring efforts and their many hours of faithful service during the months of effective planning and excellent preparations for the twenty-eighth annual convention in San Francisco, California, and

WHEREAS, innumerable responsibilities important to the success of the convention were graciously accepted and effectively carried out by many persons working in the immediate vicinity of the convention city, and

WHEREAS, the gracious hospitality, sincere efforts, and a cordial environment characterized the conduct of the convention, THEREFORE, BE IT RESOLVED, that sincere appreciation be expressed to Dr. Robert Woodward, General Chairman; Dr. Glenn I. Newhouse, Program Chairman; and to the industrial arts students, teachers, supervisors and teacher educators who gave so generously of their time and efforts to insure the success of the convention.

3. *Appreciation to the SHIP*

WHEREAS, the commercial exhibits through the SHIP make a significant contribution to the substance and spirit of the convention of the American Industrial Arts Association, and,

WHEREAS, the financial assistance of the SHIP organization in large measure provides support of the convention,

THEREFORE, BE IT RESOLVED, that the membership of the American Industrial Arts Association express their sincere appreciation to Charles H. Clawson, President of the National Educational Exhibitors Association, and Deck Officer, William F. Nameny, and his crew and to all the commercial exhibitors for their participation in the 1966 convention.

4. *New Affiliates of the American Industrial Arts Association*

WHEREAS, Association affiliates aid significantly in furthering the program of the American Industrial Arts Association and in carrying its program to the membership, and

WHEREAS, Association's petition for membership on a voluntary basis is an affirmation of interest and support for the program of the American Industrial Arts Association,

THEREFORE, BE IT RESOLVED, that affiliated membership be approved for the following associations, and their officers and members be commended for their actions in making this request:

North Central Industrial Arts Association of Ohio
Nova Scotia Industrial Arts Association
New York State Industrial Arts Association
American Industrial Arts Association State Association Officers

5. *Commendations for Teacher Recognition Program*

WHEREAS, the American Industrial Arts Association program for the recognition of outstanding industrial arts teachers in each state has continued to build a strong tie between the state associations and the parent organization,

THEREFORE, BE IT RESOLVED, that the officers and members of the American Industrial Arts Association express their sincere appreciation and commendation to Vice-President Sherwin D. Powell and his committee for excellent service in the continued promotion and organization of this program;

BE IT FURTHER RESOLVED, that expressions of appreciation and commendation be forwarded to the officers and members of the 39 state associations who have shown their cooperation in helping to make this program a success;

BE IT FURTHER RESOLVED, that the American Industrial Arts Association express deep appreciation to the officers and members of the SHIP organization for their continued financial support of the outstanding recognition program for classroom teachers.

6. *State Supervision of Industrial Arts*

WHEREAS, the American Industrial Arts Association recognizes the value of professional leadership in industrial arts at the state level, and

WHEREAS, many states do not have personnel at the state level to provide leadership in the development of industrial arts programs in the elementary and secondary schools, and

WHEREAS, the need is great for professional assistance to industrial arts teachers in planning adequate programs and facilities, and

WHEREAS, leadership is needed at the state level in the development of instructional materials and personnel through workshops and conferences,

THEREFORE, BE IT RESOLVED, that the American Industrial Arts Association, through its executive board, take positive action to assist state associations and other groups in encouraging state boards to appoint specifically trained persons to serve as state supervisors of industrial arts.

7. *Commendation to the Chamber of Commerce of the United States*

WHEREAS, the Chamber of Commerce of the United States took an official stand on industrial arts in publishing and distributing 200,000 copies of a report on industrial arts in their *Washington Newsletter,* and

WHEREAS, the Chamber of Commerce of the United States sponsored a one-half hour program explaining industrial arts on the Mutual Broadcasting System on October 17, 1965,

THEREFORE, BE IT RESOLVED that the AIAA through its officers express appreciation and commendation to the Chamber of Commerce of the United States and its Director of Manpower and Training, Mr. John Harmon, for their strong support of industrial arts, and

BE IT FURTHER RESOLVED, that requests be made to obtain similar expressions from other organizations supporting industrial arts education.

8. *Eye Safety*

WHEREAS, industrial arts education carries a major responsibility for safety education and

WHEREAS, industrial arts specifically instructs in the area of eye protection, and

WHEREAS, eighteen states have provided safety legislation or regulation through the state board or other governing body, and

WHEREAS, there is need for greater emphasis of eye safety education because of the increasing enrollment in industrial arts and the increasing complexities of our industrial society,

THEREFORE, BE IT RESOLVED, that the American Industrial Arts Association recognizes the need for stronger dedication to this cause and supports programs to strengthen eye safety regulation at the state level;

BE IT FURTHER RESOLVED, that the American Industrial Arts Association expresses its belief that the appropriate state agency for developing and promulgating rules and regulations for this area of education is the state department of education.

9. *Industrial Arts in NDEA*

WHEREAS, industrial arts was included in federal education legislation for the first time in 1965 under the provisions of Title XI of the National Defense Education Act, and

WHEREAS, this program will aid in upgrading and extending the knowledge of teachers of industrial arts through participation in summer institutes,

THEREFORE, BE IT RESOLVED, that the American Industrial Arts Association officially express its appreciation to President Lyndon B. Johnson, and to the Congress of the United States for their support of the improvement of our profession;

BE IT FURTHER RESOLVED, that the American Industrial Arts Association urges the inclusion of industrial arts under the provisions of Title III of the National Defense Education Act.

10. *Establishment of an Educational Research Information Center for Industrial Arts*

WHEREAS, such individual research of both broad and narrow scope is being conducted in various schools, colleges, and universities in the field of industrial arts, and

WHEREAS, the results of such work are often not available to the profession generally, and

WHEREAS, an educational research information center for industrial arts would provide a focus for research activity in the field,

THEREFORE, BE IT RESOLVED, that the U. S. Office of Education be urged to set up an Educational Research Information Center for Industrial Arts sponsored jointly by the American Industrial Arts Association and an institution of higher learning to be selected by the Office of Education.

11. *Appreciation to the American Association of School Administrators*

WHEREAS, there is constant need to acquaint all school and lay personnel with the place, purpose, and program of industrial arts, and

WHEREAS, the American Association of School Administrators provided such an opportunity to the American Industrial Arts Association,

BE IT RESOLVED, that the American Industrial Arts Association express its appreciation to the American Association of School Administrators for its co-sponsorship of a program on industrial arts at the annual convention of AASA in Atlantic City on February 15, 1966.

12. *Appreciation to the National Education Association for Publicity of Industrial Arts*

WHEREAS, it is important to carry the story of industrial arts to the parents of school children, and

WHEREAS, the National Education Association provided a means of carrying such a message to parents,

THEREFORE, BE IT RESOLVED, that the American Industrial Arts Association express its appreciation to the National Education Association for distributing through its American Education Week packet 150,000 copies of the brochure, "Why Your Child Needs Industrial Arts."

13. *Appreciation to the Educational Press Association*

WHEREAS, the American Industrial Arts Association is justly proud of its professional journal, the "Journal of Industrial Arts Education," and

WHEREAS, the publication was given "A 1965 Award for Excellence in Educational Journalism" by the Educational Press Association of America,

THEREFORE, BE IT RESOLVED, that the American Industrial Arts Association accept the award and express its appreciation to the Educational Press Association of America for their recognition.

14. *Appreciation to the American Hardboard Association*

WHEREAS, instruction in industrial arts can be greatly enhanced by cooperation between the schools and industry, and

WHEREAS, the American Hardboard Association provided a grant for use in preparing instructional materials of direct use to teachers of industrial arts,

THEREFORE, BE IT RESOLVED, that the American Industrial Arts Association express its appreciation to the American Hardboard Association for its efforts in aiding teachers to interpret this important segment of industry.

15. *Commendation to the NEA for its Support of Industrial Arts*

WHEREAS, the National Education Association provides services of all types which are invaluable, and

WHEREAS, the officers and staff of the NEA continuously cooperate with the American Industrial Arts Association for the improvement of industrial arts, THEREFORE, BE IT RESOLVED, that the American Industrial Arts Association express its appreciation to Richard Batchelder, President, and William Carr, Executive Secretary, and officers and staff of the NEA for their continued support of industrial arts.

16. *Industrial Arts Teacher Recruitment*

WHEREAS, the shortage of qualified industrial arts teachers in American schools has been termed critical for several years, and

WHEREAS, the shortage seems to be becoming even more critical, and

WHEREAS, any professional body has a responsibility for furnishing qualified personnel to the field it serves,

THEREFORE, BE IT RESOLVED, that the American Industrial Arts Association initiate and develop a plan for teacher recruitment on a national basis.

17. *WHEREAS,* Senator Wayne Morse, Senator Winston Prouty, Senator Birch Bayh, Congressman Hugh Carey, and Congressman Sam Gibbons have demonstrated their sincere interest in the field of industrial arts education by their efforts in extending the provisions of Title XI of the N.D.E.A. to include industrial arts,

THEREFORE BE IT RESOLVED, That the AIAA award honorary membership to Senators Morse, Prouty, and Bayh, and to Congressmen Carey and Gibbons and extend to them the sincere appreciation of the Association.

18. *WHEREAS,* The Legislative Commission of the NEA has used its knowledge and skill to advance the purposes of industrial arts education through national legislation, and

WHEREAS, the efforts of this commission have aided immeasurably in the inclusion of industrial arts under Title XI of the NDEA,

THEREFORE, BE IT RESOLVED, that the AIAA award life memberships to Dr. John Lumley, Director of the NEA Legislative Commission, and to Mr. Stanley McFarland, Assistant Director of the NEA Legislative Commission.

19. *WHEREAS,* a significant change in the national office of the AIAA was made five years ago with a move to Washington, D. C., and

WHEREAS, a full-time executive-secretary and staff were established at that time, and

WHEREAS, this five-year period has seen significant growth in the AIAA, and

WHEREAS, the AIAA has assumed national status, symbolized by the inclusion of industrial arts in the National Defense Education Act in 1965,

THEREFORE, BE IT RESOLVED, that the executive-secretary, assistant executive-secretary, and the staff of the AIAA be commended for their tremendous efforts in building and expanding the association.

Teacher of the Year Program
The Uncommon Man

RICHARD M. CLOWES

Burbank Unified School District
Burbank, California

Attending this convention are people who have become eminent in their fields in many ways—statewide and in some cases nationwide in their reputations for accomplishment; and in every case, I'm sure, the greatest distinction of these people has been that among the members of their own professions, they have been recognized as leaders, as producers, as men and women of ability, with the vision and the drive to carry out their mission. The honor paid one by his own profession is among the greatest of honors that can be bestowed.

And so, tonight, as a group of teachers are honored by their fellow teachers, it must be the high spot in the career of each of these persons. And it should be. To be chosen an outstanding teacher under any circumstances is an honor. To be so chosen by teachers in his own special field is the ultimate honor.

Recently I read some comments by one of our industrial leaders, Mr. William Zisch, President of Aerojet General Corporation. He spoke about what he considers to be one of the real needs of our time—the development of "the uncommon man." Not the *common* man, the *ordinary* person, but the *out-of-the-ordinary man.*

The "uncommon man" according to his definition is the person who, like Thomas Edison or George Washington and like other great Americans, is willing to uphold ideas he considers important, and thus becomes a leader. His claim was that in the United States today we need to look to, and encourage the "uncommon man"—help him to recognize his abilities, give him freedom, and be thankful he's around.

The thing Mr. Zisch was really talking about was the development of leadership. And in this respect he was almost echoing what a month or two ago was said by Mr. John Gardner, former President of the Carnegie Corporation, and now Secretary of the Department of Health, Education and Welfare.

Mr. Gardner's contention is that of *all* our leadership problems in this country, the greatest one is that we are not doing enough to encourage potential leaders in this generation. And it is the people such as this group of outstanding teachers to whom he would look for that potential.

Mr. Gardner points out that in the late eighteenth century we produced out of a small population—four million—a truly extraordinary group of leaders—Washington, Adams, Jefferson, Franklin, Madison, Monroe, and others.

Is it possible today, he asks, with a population fifty times greater, that we can produce men of that caliber? Or are we doing so and not recognizing them? Are the Dean Rusks and the John Foster Dulles' equal in our time to the Benjamin Franklins and the James Madisons of theirs?

It's interesting to speculate—how would the great men of the early days of the republic have dealt with some of the problems that we face today both in our international and in our domestic affairs as a nation? What would Washington have done about entangling alliances? How would Franklin have dealt with de Gaulle? What would Jefferson have said about education? And what would Horace Mann, in a later era, have had to say about public education? We don't know, of course, and it's not really necessary that we do, because we have both the talent and the potential today to deal effectively with these problems. And the outstanding teachers who are honored tonight are evidence of this potential in the field of education.

Now when there is potential, there's usually going to be accomplishment. But along with the potential there must also be several other ingredients, one of which is confidence. Anyone who accomplishes anything of significance today has more confidence than the facts would justify. This is something shared in common by outstanding athletes, gifted military commanders, brilliant political leaders, great artists, and fine teachers. Each is confident that he can do more than is expected of him; and as a result, he often does.

The prominent political leader today is not necessarily the greatest scholar or the finest speaker. But he has to be a person of ability, who sees what he thinks needs to be done, and then has confidence that he can accomplish it. And so, he becomes a leader.

The young teacher today could easily adopt the belief that he will be an anonymous member of a mass of society; an individual lost among millions of others. But on the other hand, he can also be aware that we live in a time when the problems are bigger than they've ever been before; and somehow, big problems have a way of producing big people to solve those problems.

Those big people will come from the ranks of groups like this. They are the uncommon men and women of our day. This is what they've become because they had ability; they determined to remain individuals; and they had confidence in themselves and in those around them. These are the qualities about which the President of Aerojet was undoubtedly thinking when he suggested that we "recognize your abilities, give you your freedom, and be thankful you're around." I'm sure this is how we all feel as we congratulate the 39 outstanding industrial arts leaders of 1965. ■

State Representative Breakfast—April 22, 1966

The Annual Breakfast of AIAA State Representatives convened at 7:40 at the San Francisco Hilton with Kenneth Dawson, Executive Secretary, presiding.

The AIAA Executive Board and the National Membership Chairman were introduced by Dr. Dawson.

Minutes of the previous meeting were read and approved.

Dr. Dawson reported that a membership pin for life members has been designed and approved for production.

Sherwin Powell, Vice President for Classroom Teachers, discussed the "Teacher of the Year" program. He indicated that 54 of 58 state representatives responded to his communication concerning this matter. Mr. Powell stated that 39 states were participating in the 1966 program. He thanked the state representatives for their efforts in promoting the "Teacher of the Year" award.

Dr. Dawson discussed the rebate to states which amounts to 50¢ per member and stated that the procedure would not be followed in the future. During the discussion, Mr. Leroy Bengtson (Oklahoma) indicated he saw no reason for a rebate. Mr. Lynn Barrier (North Carolina) stated that members paid only $4.50 or $9.50 and kept the 50¢. Mr. Roland Nagel (Missouri) expressed deep concern in elimination of rebate and doubted if the Missouri association would function actively with the AIAA. Mr. Paul Hiser (New York) viewed rebate as an important item for state associations. The amount of expense necessary to promote the AIAA is rather great and the token return is appreciated. He felt that this was a positive point which attracts state affiliation. Mr. Joe Luke (Utah) desired a set fee for dues and expressed elimination of rebate. Mr. Richard Vasek (Mississippi) suggested an AIAA fund for states that are in need of financial assistance for AIAA promotion. Mr. Oscar Haynes (Indiana) felt that it was not really the 50¢, but the idea of support to the state associations. Mr. Durant Mosley (California) stated that the 50¢ rebate had a "grass roots" implication which was good, but the 50¢ itself was not necessary in the case of California.

Dr. Blair MacLean (Michigan) moved to support the Executive Board's decision not to continue the present system of rebate to states. The motion was seconded by Mr. Richard Vasek (Mississippi). Motion carried 26 to 2.

Dr. Dawson said that state representatives can call upon the AIAA for limited membership promotion funds. In order to facilitate processing, blocks of membership cards may be forwarded to state representatives and issued to the member upon payment to state associations.

Dr. Harry Gunderson, AIAA National Membership Chairman, described the method used to organize the National Membership Board which has six members at this time and will be expanded to seven. The United States is to be divided into 6 areas plus Canada. This group has set forth guidelines which state that the State Membership Chairman should: (1) be present at all state meetings, (2) have AIAA promotional materials, and (3) keep in constant communication with AIAA. The National Membership Board would function as a suggestion board. It was felt that each member could visit various states in promoting AIAA membership and that the AIAA consider a budget for this purpose. Dr. Gunderson emphasized the state representatives' role as spokesmen in their states and that they must continue their efforts to encourage the Teacher of the Year program.

A great deal of discussion was devoted to a promotional kit which should be available to each state. Various publications, the *Journal*, and many association facts and figures should be considered as promotional items. Dr. Kenneth Schank (Wisconsin) suggested that State Association Officers could assist in membership matters.

Dr. Dawson explained a new procedure for a continuous membership year, rather than the July 1, membership year. This would assure members a full year's benefit no matter when their memberships are processed.

The meeting was adjourned at 9 a.m.

Respectfully submitted,
Jack Simich
Assistant Executive Secretary
AIAA

Industrial Arts Clubs

Chairman: Leonard W. Glismann, Salt Lake City Schools

Recorder: L. H. Bengston, Oklahoma State University, Stillwater

Host: Henry Cole, McClymond H.S., Oakland City Unified

Presentation: Rex Miller, State University College, Buffalo, N. Y.
(paper included)

Balfour: representative distributed information about jewelry

College election and program conducted by L. H. Bengston

The constitution committee reported on progress of the revision of the constitution.

Election was conducted by David Bradley, Club Secretary.

Results:

President—Charles A. Gibson (N. Y.)
V. President—Don Alexander (N. C.)
Secretary—Charles Shiflet (Colo.)
Treasurer—Fred Carter (Texas)
Reporter—Don Thiriat (Utah)
Parliamentarian—Leland Dreyer (N. Dak.)

Winifred Mayfield presided at High School group program.
(paper included)

Notes on Verbal Presentation: State and national levels should work towards a common interest.

Building the good teachers needed can be helped thru I-A Clubs.

We know that clubs provide maturity and leadership.

Education is the primary purpose of I-A Clubs.

Mr. Hodges (Texas) made a brief presentation on the possible funding of I-A clubs.

High school group did not elect new officers.

Respectfully submitted,
Donald O. Strel

Special Interest Sessions

Session A

Frontiers in the Industrial Arts Areas of Automotive and Power Mechanics

TED A. McCOY

Automotive Section, Hanford High School, Hanford High School District
Hanford, California

My topic is "Frontiers of Industrial Arts Automotives." After considerable deliberation about "frontiers" and what it meant, I reached the conclusion that we are presently *at* the frontier, and further we as teachers of automotives are the "frontiersmen."

Before continuing, let us examine our present program and see what it comprises. An industrial arts automotive program may be identified by a number of titles. Regardless of the title, our automotive programs are basically the same. They subscribe to the major objective that the students involved should acquire an understanding of the principles involved in the operation of the various components of an automobile. The emphasis with very few exceptions throughout our nations schools, *is* the automobile.

Recently I was privileged to work with the Automotive Technical Committee of Central California. The aim of this committee was to establish some form of automotive curriculum that could be acceptable to all automotive instructors in California. The committee did a wonderful job of confirming and compiling what we all more or less agree on. The finished publication, *Industrial Arts Automotive Mechanics, An Introductory Course of Instruction,* was printed by the State Department of Education and distributed to every automotive instructor in the state. Everything that was excluded from this publication then becomes *our* automotive frontier. The frontier, in the sense that we use the term, refers to "the incompletely developed region of a field of knowledge."

There is not much we can do in industrial arts automotives to expand the frontiers as far as the *automobile* is concerned. That is under control. Constant revisions and upgrading of content and methods must be continued; but, the boundaries have been clearly drawn in any number of publications such as the one I have mentioned. Changes and expansions of the program would be dependent on changes and innovations that are introduced by the automotive industry. As long as our courses are limited to the automobile, we become static in our offering.

My deep concern is in those other areas of motive power and power transmission that are completely ignored in our automotive courses.

Dr. Joseph W. Duffy's book, *Power, Prime Mover of Technology,* illustrates quite adequately where the shortcomings of our automotive frontier lie. Aerodynamics, to include aircraft piston engines, jet engines, . . . gas turbines; steam power, including steam turbines, steam generators, power plants, atomic fuels; compression ignition engines . . . the Diesel; rocket engines and other propulsion systems . . . not to mention hydrodynamics, magnetism and the expansion of the use of levers, shafts and the inclined plane. These things I have mentioned just scratch the surface of the potential for inclusion in the automotive program. These things are upon us and being used. They are not in the experimental stage, to be relegated to the scientist. Why should our students be deprived of these exploratory experiences? These are machines and they need mechanics and technicians. There are job opportunities in these industries as well as in the automobile industry. We make the mistake of assuming that all of our students are interested in *automobiles*, when actually they are interested in mechanics—of any kind.

I think we tend to be hypocritical in our approach to these so called "sophisticated" and "exotic" means of motive power and power transmission. In order to stimulate interest at our own industrial arts professional meetings, we engage a representative from the space industry to relate to our members the wonders of scientific and technological advancement. We are awe-inspired, interest is high . . . Why don't we provide the same service to our industrial arts students?

The time has come when we can no longer ignore these areas of motive power and power transmission as an integral part of general education. We have talked about it and thought about it long enough. Now we must do something about it. I can think of no better place to start the pendulum swinging than here and now at this convention of the American Industrial Arts Association. If these things are to be included in the curriculum of our nation's schools, the rightful place for inclusion is in the industrial arts department.

How are these changes to come about? You know the process as well as I do. This falls into the category of a curriculum change and curriculum changes come about very slowly. Fast or slow, it must get started:

1. The first step is to educate yourself. Believe. Read, tinker, and experiment in the privacy of your own domain. I doubt if you will have trouble finding materials on the subjects involved.
2. Introduce pilot courses offering this new approach to motive power. Don't abandon your present course offering, but offer this as a parallel. There may be some pilot courses now. Search them out and exchange ideas.
3. Establish special interest groups in your area dealing with this subject

matter. Share and develop your ideas with interested fellow teachers. Include your science and mathematics personnel.

4. Put a little pressure on teacher training institutions to provide courses on the subject. Colleges will offer these courses if they are in demand . . . that's why they are there.
5. Press your supervisors, coordinators, and consultants for state and national curriculum studies.
6. Request federal assistance through NDEA or other grants. Federal agencies have been discussing our faults and shortcomings for years. Let's see if they are willing to provide some funds.
7. By all means use the full resources of industry. They, perhaps most of all, are interested in promoting their industrial interests, and are more than willing to assist.
8. Finally, use your professional organizations as coordinating agencies.

Leadership in this undertaking will have to develop. It has been said that "Leadership bubbles up from the bottom, it does not dribble down from the top." If anything is to be done, it will have to start at the grass roots and grow from there. This does not exclude the leadership, guidance and assistance from your supervisors, coordinators, and teacher trainers. I should hope that the American Industrial Arts Association would take an active position of support.

In conclusion, we must decide what is important; that the students gain considerable insight into the operation and service of the automobile, a *specific* means of motive power; or, is it our responsibility to transmit to the student basic theory and exploration into all modes of self-propelled vehicles—or, in fact, any device pertaining to the application of power to produce motion?

Scientific and technological changes seem to be coming more rapidly than we can digest them. In our lifetime, we have seen more scientific and technological change than in all the previous history of the world. An enormous acceleration has occurred in technology even within the past few years. William O. Baker, Vice-President of Bell Laboratories, illustrates this dramatically by pointing out the narrowing interval between discovery and application in the physical sciences. The interval for the electric motor was 65 years, for the vacuum tube 33 years, for the X-ray tube 18 years. But it was only ten years for the nuclear reactor, five for radar, and no more than three for the transistor and the solar battery.

"We are at the point," says anthropologist Margaret Mead, "where we must educate people in what nobody knew yesterday and prepare in our schools for what some people *must* know tomorrow."

Vannevar Bush has said, "Science is a continuous frontier." I should hope that this will hold true with our automotive frontier.

There is a Chinese proverb which states, "To live is to change . . . to change is to live." ■

JAMES L. SMARTT

Cubberley High School, Palo Alto Unified School District
Palo Alto, California

Industrial arts has as one of its foremost objectives an interpretation of technology, usually with a general education approach. As a rule, we have limited our exploration into power development devices to the automobile, with an occasional isolated course in diesel and aircraft power plants. Most of us in auto mechanics limit ourselves to brief discussions of the regenerative gas turbine, the rotary engine, and the fuel cell because of time demands and limitations in facilities and instructional materials. It is not the purpose here to argue with present course offerings. If we wish, however, to keep abreast of current and future technological developments in a rapidly expanding field of power production, and if we really have as an objective the interpreting of technology, then we must not overlook this field. Power production and transmission offers one of the richest and most interesting areas of instruction in industrial arts. Thus far, in general, we have barely scratched the surface of its possibilities. Nowhere else in the field of secondary education do the facilities or teacher experience and orientation offer the possibilities for instruction in power development and power transmission which are offered in the industrial arts laboratory.

Implementation of the Program

Implementation of a Power Mechanics program is not an easy task. Time is probably the most limiting factor; facilities and instructional units run a close second. Extensive use of audivisual aids such as films, film strips and overhead projector slides can be most helpful when units under discussion are not available. Much lecture-discussion-demonstration time is mandatory. Coordination of manipulative experiences with subject matter is most difficult. Building models of operational units (such as steam engines, turbines, etc.) can be very educational and functional in providing manipulative activities and developing basic tool-using skills. The possibilities are limited only by the time, energy, and ingenuity of the instructor and the experience, interest and ability of the student. Student interest can be maintained at a high level if instructor interest is at the same high level—of this I am sure you are aware.

A Question and a Plea

What *is* power mechanics? The term is subject to many interpretations. A survey of current texts is indicative of this fact. This is as it should be, for out of differences of opinion come new ideas and exploration. In our zeal to be new and different (should that be our goal), let us change the course content as well as the title. If we are teaching a course in auto mechanics, then we should be proud of the fact and call it auto mechanics. If we are teaching a course in small gasoline engines, then it should be designated as such. If we incorporate both of the above areas of instruction with other forms of internal and external combustion engines, solar and nuclear power and other areas, then let us label the course power mechanics and strive to the best of our ability to offer an instructional program which is a credit to the name. ■

Session B

Frontiers in the Industrial Arts Area of Drafting

FRANK E. MAHAN

Portola Junior High School, Los Angeles City Schools
Tarzana, California

One of the big problems facing educators is how to develop a thinking student. Too often we forget about developing critical and creative thinking, but instead concentrate on pumping ever-multiplying numbers of facts into students' heads, only to discover that the knowledge explosion is making these facts obsolete as fast as we can teach them. Instead of concentrating on teaching facts, we must teach the ability to educate oneself and develop original and descriminating thinking.

Well-chosen engineering problems are a good medium for improving thinking ability. In order to create interest in the projects, they must not only be challenging, but timely. An example is a glider designed to land supplies in Viet Nam. The glider must be light, easily stored (folded), and able to descend rapidly in order not to be shot down. It also must land softly and be able to make pin-point landings, remotely controlled from the ground. A project does not have to be involved with current events, but it should give the student the feeling that it is realistic and can be carried out in real life.

Knowledge-sharing among students is a positive outcome of a variety of projects. A student may become the "expert" in a certain field and share information with other students. This interaction between students not only adds interest, but gives each student an overview of many areas and information that may apply to his own project. A student cannot do a project in every area, but through his peers he can learn a little about a lot of different areas. At the end of the semester, each student presents his project orally, subject to challenges and questions from the rest of the class. His drawings, models, and engineer's report are all used in this final presentation. Most of these engineering problems involve a great amount of outside research and require the student to draw on his proficiency in math, science, English, descriptive geometry, and drawing skills.

Important considerations when designing problems to raise the horizons of the gifted student are:

- Offer him a challenge more difficult than anything he has done in the past.
- Let him know it is difficult. Gifted students like to know they are doing extraordinary work.
- Give him the opportunity to see the problem develop from a few paragraphs on a piece of paper to a finished project complete with drawings, model, and engineering report. He can see it and say, "I did this!"
- Give him a contest against himself and previous accomplishments instead of against other students. As one of my students put it, "It's just you against the problem!" ■

JOHN R. WHITE

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Palo Alto, California

The plight that many business firms and government organizations have with their systems flooding them with paper they are powerless to hold back, have no place to store, or effective means of using, has created a need for a faster, cheaper way of handling this material. In order to maintain competitive positions, management must first eliminate unnecessary records; and then employ better, more economical means of producing that which remains valid and necessary.

There are a number of ways to automate the preparation of original documents compatible to modern high speed reproduction. Unfortunately, the greater majority of this work to date—within the range of the average company's pocketbook—has centered around the "corporate" as opposed to the "engineering" record. Automated or machine programed drafting is limited to special applications that are economically feasible with only the very large organization. Small business cannot dispense with the draftsman—and yet, this same organization finds modern reproduction equipment convenient to its budget.

These modern systems of retrieval often require careful considerations in the preparation of originals and one often gets the impression that the tail is wagging the dog. It's no wonder that animosity exists between the draftsman and the print shop. I contend that this animosity could better be labeled ambiguity and, as such, be dissolved in a solution of common sense, understanding, and basics.

Far too often we fail to understand and appreciate each other's problems. It is just as important for the reproduction department to understand the problems of the draftsman as it is for the draftsman to better understand the limitations of the print shop. Therefore, the first basic I recommend is that the chief draftsman and the reproduction manager learn early in the game that they must work together to pull the total load in the same direction.

By using modern advances in the science of microfilm, up-to-date electrostatic printing processes and fast offset printing techniques, it is not only possible to produce more paper—faster, but it is realistic to expect significant and dramatic savings. For example, an "E size" drawing (34" x 44") reproduced using standard diazo techniques will average 40c per copy in a typical plant (including labor, materials, overhead, and burdens). On the other hand, we at Varian Associates—using a system of microfilm—have reduced this cost to 6.5c with a savings of 34.5c each. In other words, we can produce over five copies of an E-size drawing via the systems route for the same price as one diazo print. In doing so, the original is handled only once per revision reducing wear and tear; we increased production 165 per cent with 40 per cent fewer people; we reduced waiting time for prints from five hours to five minutes; we established a duplicate source of data with our mountain vault-stored unitized microfilm that protects the company against disaster; contractual obligations that require compliance to rigid government specifications over drafting practices, reproduction and microfilm per MIL STD 9868, is accepted on a "of course" basis.

It has been said by chief draftsmen that the use of microfilm places extensive and expensive burdens upon the drafting department; burdens which require more time to prepare original drawings; compliance to autocratic standards, extensive checking; and redrawing of existing material. I suspect that the natural desire of chief draftsmen to up-grade the over-all quality of their drawings prompts them to use microfilm as an excuse rather than reason. It is not necessary to have fancy drawings because of microfilm. Anyone (with or without formal drafting training) can prepare line work acceptable to the camera. All that is necessary is a *factual* understanding of the limitation of the equipment *and* a willingness to cooperate. I have found through my long and close association with drafting and reproduction and microfilm that by using common sense, the draftsman need not go to a great deal of effort to allow for the problems of micro-reproduction. Actually, it has been shown that with greater emphasis on basic drafting practices the draftsman will have more time to devote to his primary responsibility. No one will argue that the most important job of the engineer and draftsman is thinking. The picture part of drawing is secondary; simple, concise, better prepared standard drawing habits leave more time for creative thinking.

I will discuss some of those points designed to overcome costly drawing habits in preparing workable drawings that will be exposed to a micro-retrieval program. These points are based on the elimination of the non-essential, the full use of all available tools, an increased knowledge of the purpose of drawing and a better understanding of reproduction processes to be employed. As simple and elementary as they may seem, their serious consideration and application will greatly assist the micro-photographer to overcome his two primary problems: resolution and density.

Resolution is the ability to clearly define features of a drawing, especially those in close proximity to one another. If a draftsman knows that his drawing will be reduced as much as 50 per cent, he should consider the effect of this on his work as he draws it.

Density, the light-absorbing quality of a photographic image is that quality that allows us to tell the difference between line work and background. The greater the contrast on the original, the more improved will be the density characteristics, and the fewer varieties in contrast the better.

This presentation demonstrates the importance of emphasizing the following basic drafting principles: wherever possible, use words instead of a picture; use the minimum necessary views; use dotted lines only to clarify; use cross-hatching for clarification only, spacing the hatch lines as wide as possible; use machine-set copy for lengthy notes; use free-hand techniques where suitable; express dimensions and tolerances clearly; put emphasis on the all-important decimal point; consider legibility of reduced size prints; provide constant contrast between the written or drawn expression and the background; the density of all lines and characters must be equal; line and character height and spacing must be consistent with (or proportional to) the reduction ratio being employed; rotate the pencil; maintain a constant angle of pencil to sheet; hold a minimum letter height of ⅛"; use a minimum number of different pencil degrees on a single drawing; avoid pencils which wear quickly; use erasers and techniques that erase gently; protect lines and lettering; protect the sheet surface. ■

Session C

Frontiers in the Industrial Arts Area of Electronics

Chairman: **Charles B. Porter,** Illinois State University, Normal, Illinois

Presentations: **Allen Platt,** Emerson Junior High School, Los Angeles City Schools, Los Angeles, California
Nicholas Saba, Skyline High School, Oakland City Unified School District, Oakland, California

Recorder: **Bruce Akers,** Burbank Unified School District, Burbank, California

The presentation by Allen Platt represented the electronic program in the Los Angeles City Schools at the junior high level. His course as presented was in three levels, the basic 10-week course, the advanced course of 20 weeks, and a TV and radio repair semester of 20 weeks. Emphasis is placed upon stimulation of the student with a wide range of manipulative skills, taught by a series of typical electronic projects coupled with theoretical emphasis. Point-to-point wiring is stressed as this is the kind of wiring students are most apt to do on home projects.

The second semester involves more difficult projects such as a 2-tube amplifier. Notebooks are stressed and student is encouraged to develop projects of his own. The third and last semester, they may enroll in what is called "radio and TV repair." This course requires some actual repair and a research project. 40 percent of the work is lecture, some 60 per cent is shop work.

Mr. Platt expressed the idea that the junior high program must build interest, must motivate, must get the student excited to move on into electronics on the high school level. The use of an electronics honor roll for outstanding students has created a goal that many of his students over-achieve in striving for.

Mr. Saba presented a most logical approach to the electronics classes in the senior high school. His approach to electronics involves the teaching of electronics in six levels that he has determined from the general field of electronic employment opportunities. These six levels are arranged from assembler to technician and each level is viewed from what to teach, why to teach, and when to teach.

The selection of students involved only a simple formula of Mr. Saba's—"If the student can take me, then I can take him." The only criteria is that the student must perform to his mental abilities.

Mr. Saba expressed the idea that the learning must be meaningful to both himself and the student. The organization of the class is a very loose structure; it must "belong to the student." Discipline is a factor only if it affects others than the student himself. Mr. Saba felt that most discipline problems were solved by direct and immediate interaction with the parent. The idea was expressed that other teachers and members of the community must know and understand what you are doing and why.

His basic construction unit consists of a metal chassis with 18 octal sockets mounted thereon. Wiring may be accomplished underneath in typical style, with emphasis upon workmanship. Various circuits are constructed, modular style, for insertion into the sockets on the chassis. The flexibility of the unit is limited only by the imagination of the student and the instruction. Some 120 circuits are in use at present. The student is taught to go from the schematic to the unit or in reverse. This represents "the normal to the abnormal, abnormal to the normal."

A notebook is stressed and is a continuing unit of work as the student progresses at his own rate of development. He may use his own ideas but they must be to the level of attainment of which the student is capable.

Emphasis is placed upon the student developing skills as he progresses through each level, either for employment or to move on to more difficult studies. ■

Week I

1. Explain course to pupils.
2. Show required projects.
3. Demonstrate all equipment, tools, and explain drill procedures.
4. Give and grade safety tests.
5. Get class started on their work.

Week II

1. Place heavy emphasis on cleanup first day.
2. Demonstrate
   a. chamfers
   b. soldering
   c. gouging
   d. soldering leads on a light
3. Lesson
   a. How to set up a notebook
      (1) Title page
      (2) Table of contents
   b. Atomic Theory
      (1) Number of elements
      (2) Atom construction
      (3) Electrical charges of atoms
      (4) Method of electron flow

Week III

1. Lesson
   a. History
      (1) Describe progression of electricity from Thales to the laser beam.
   b. Light
      (1) What is light
      (2) Incandescent bulb, its invention and Edison's work
      (3) Fluorescent light, percentage of light

2. Lesson
   - a. Threading
      - (1) Taps and dies
      - (2) System of marking screws

Week IV

1. Demonstration
   - a. How to read a blueprint
   - b. Use of chassis punch
   - c. Wire strippers
   - d. Exchange punch-outs for parts
2. Lesson
   - a. Conductors—insulators
      - (1) Differences between two
      - (2) Best three of each
   - b. Conduit
      - (1) Why it's used
      - (2) Solid—flex
3. Lesson
   - a. Electron generation (Part I)
      - (1) Static electricity
      - (2) Pressure
      - (3) Heat
   - b. Electron generation (Part II)
      - (1) Light
         - (a) Demonstrate photocell reaction to sunlight and match with V.O.M. on D.C.M.A. scale
      - (2) Chemically
         - (a) Show a dry cell, its construction, battery sizes
         - (b) Explain difference between wet and dry cells
         - (c) Demonstrate a two-penny battery construction
      - (3) Magnetism
         - (a) Demonstrate a flux field with a magnet, iron filings and a sheet of plastic

Week V

1. Lesson
   - a. Terminology
      - (1) Polarity
      - (2) Continuity
      - (3) Schematic
      - (4) Symbols

2. Review for test
   a. History
   b. Light
   c. Threading
   d. Conductors-insulators
   e. Conduit
   f. Electron generation
   g. Terminology
3. Test I and grade notebooks

Week VI

1. Lesson
   a. Electromagnetism
      (1) How field produced
      (2) How to increase field
      (3) Demonstrate with electric cannon
2. Demonstration
   a. As each boy finishes tying underwriters knot after the chassis has been painted, he teaches the next person how to tie the knot.
3. Lesson
   a. Fuses—circuit breakers
      (1) Different types
      (2) Correct size for house use and how they are distributed
      (3) How a fuse burns out
      (4) Why circuit breakers are used and how they are different from fuses
   b. Kilowatt-hour meter
      (1) Why it's used
      (2) How to read
   c. Homework assignment
      (1) Draw out fusebox or circuit breaker box. List at what amperage each unit will burn out.
      (2) Draw meter section of K.W.H. meter and read

Week VII

1. Lesson
   a. Terminology
      (1) Voltage
      (2) Amps
      (3) Ohm
      (4) Watts
   b. Compare the above terms to a water tank or to throwing an object through the air

2. Lesson
   a. Currents
      (1) D.C.
         (a) Battery symbol and construction
         (b) Why batteries lose their electric charge
         (c) Show graph of current flow from battery
      (2) A.C.
         (a) Sine wave symbol
         (b) Compare A.C. to running a race on an oval track
         (c) Explain how voltage varies with the cycle
         (d) House current at 117 VAC, 60 C.P.S.

Week VIII

1. Review
   a. Electromagnetism
   b. Fuses—circuit breakers
   c. Terminology
   d. Currents
2. Lesson
   a. Circuits
      (1) Open (compare to lights above chairs)
      (2) Closed (compare to lights above chairs)
      (3) Series (compare to city street lights)
      (4) Parallel (compare to city street lights)
      (5) Short (show situations how voltage could not be all used up from source)

Week IX

1. Final Test; correct notebooks and grade projects
2. Advanced work
   a. Briefly discuss electronics program in upper classes
   b. Demonstrate basic electronics class project
3. Finish up work and prepare materials for next class

COURSE OUTLINE FOR ADVANCED ELECTRONICS

Week I

1. Class requirements
    a. No required project
    b. Repair seven electrical items by end of semester.
2. Lockers, drill procedures
3. Shop tour, personnel jobs
4. Give and grade safety test
5. Show how to make out repair ticket, keep one copy and attach copy to unit repaired.
6. Bulletin board assignment groups
    a. Each row has one week to fix bulletin board displays
    b. Come up with central theme, space-safety-servicing-color TV-computers-etc., and put up appropriate charts

Week II

1. Review
        (1) Types and construction
        (2) Symbols and units
        (3) Color code
        (4) Wattage
        (5) Tolerance
        (6) Defective or burnt resistors
    b. Capacitors
        (1) Types and construction
        (2) Units and converting mfd to PF
        (3) Different types of capacitors, symbols, troubles, testing
    c. Solder
        (1) Three types and uses
        (2) Good work
        (3) Repair cold joints
2. Homework
    a. Section Three, Chapter 22-23 (Text: *"Understanding Electricity and Electronics"*)

Week III

1. Review
   a. Transformers
      (1) Flux fields
      (2) Self induction
      (3) Mutual induction
      (4) Lenz Law, XL=2TT FL
      (5) Xfm construction
      (6) Turns ratio.
      (7) Major types and uses
      (8) Troubles, testing, Xfmr losses
   b. Vacuum Tubes
      (1) Marking systems
      (2) Microphonic tubes
      (3) Air inside tubes
      (4) Diodes
      (5) Triodes
      (6) Tetrodes
      (7) Pentodes
      (8) Tube tester
      (9) Directly vs. indirect heated tubes
2. Homework
   a. Section Three, Chapter 27

Week IV

1. Lesson
   (a) Block diagrams
      (1) T.R.F. radio
         (a) Use of coils to transfer signals
      (2) Superheterodyne receiver
         (a) Basic operation
         (b) Difference between two radios
2. Homework
   a. Section Eight, Chapter 50-51

Week V

1. Lesson
   a. Ohms Law
      (1) D.C. ohms law formulas
      (2) Magic circle
      (3) Sample problems on board
         (a) Resistors in series=add, parallel=formula
         (b) Capacitors in series=formula, parallel=add
         (c) Inductors in series=add, parallel=formula
      (4) Powers of ten

2. Homework
    - a. Section Six, Chapter 42
3. Test I and grade notebooks

Week VI

1. Lesson
    - a. Ohms law
        - (1) A.C. ohms law formulas
            - (a) Capacitive reactance
            - (b) Inductive reactance
            - (c) Impedance
        - (2) Sample problems on board
2. Homework
    - a. Hand out A.C.-D.C. ohms law problems on sheet

Week VII

1. Lesson (Three-part lesson)
    - a. Electronic math review
        - (1) D.C. ohms law
        - (2) A.C. ohms law
    - b. Associated math skills
        - (1) Powers of ten
        - (2) Converting electronics terms by powers of ten
            - (a) MFD$=10^{-6}$
            - (b) P6$=10^{-12}$
            - (c) MILLI$=10^{-3}$
            - (e) MEGA$=10^{6}$
            - (d) KILO$=10^{3}$
        - (3) Binary math (0 and 1)
        - (4) Slide rule
            - (a) Get pamphlets from math department
            - (b) Sell 25¢ slide rules from Ohmite to those who want them.
    - (c) Show and demonstrate how to:
        - (1) multiply
        - (2) divide
        - (3) square numbers
            - (4) cube numbers
    - c. Homework
        - (1) Give problems on board in following areas
            - (a) D.C. ohms law
            - (b) A.C. ohms law
            - (c) Powers of ten
            - (d) Coversion

        (e) Binary numbers
        (f) Slide rule functions

Week VIII

1. Continuation of week seven's lessons
2. Offer help at lunch for those who need help

Week IX

1. Lesson
    a. Speakers
        (1) P.M. and E.M. types
        (2) Speaker construction
        (3) Voice coil operation
        (4) How to tell if defective and how to repair
    b. Homework
        (1) Section Eight, Chapter 48

Week X

1. Equipment review
    a. Be certain at this time all students can operate the following equipment:
        (1) Battery eliminator
        (2) Tube tester
        (3) V.O.M.
        (4) Audio generator
        (5) R.F.-A.F. signal generator
        (6) Use of tube manual
2. Hand out "Tube manual sheets" for homework. Three weeks to complete.
3. Test II and grade notebooks.

Week XI

1. Semester reports
    Each student picks a topic and does research project report. Information can come from company or library.
    a. Infra-red waves
    b. Radio-TV service programs in schools
    c. Micro electronics
    d. Medical electronics
    e. Industrial electronics
    f. AM-FM transmission
    g. TV-color TV differences
    h. Lissajons patterns
    i. Electronic math, how used

- j. Radio troubleshooting chart
- k. TV trouble shooting chart
- l. Ham licenses, types of transmission
- m. Semiconductors
- n. Tunnel diodes—transducers
- o. Lasers—masers
- p. Space electronics
- q. TV cameras
- r. Vacuum tubes
- s. EE programs in colleges
- t. Computers
- u. Military electronics
- v. Microwave transmission
- w. Teletype communications
- x. Careers in electronics

Reports due 18th week of semester in final form.

2. Lesson
   - a. Half wave power supplies
     - (1) Silicon diode operation
       - (a) Testing
       - (b) RL, B+, B—
     - (2) Selenium rectifier operation
     - (3) Pi filtering system
     - (4) Choke advantage
   - b. Homework
     - 2. Section Eight, Chapter 49

Week XII

1. Lesson
   - a. Full wave power supply
     - (1) Explain operation and filtering
     - (2) With scope show difference between half-wave and full wave power supplies.
2. Review
   - a. Operation of typical half-wave power supply used in a superheterodyne radio. Demonstrate with Packard Bell SRI radio.
3. Class work lesson
   - a. Class split into groups of four or five
   - b. One member of each group *bring* a working typical house radio. Before class have each boy remove the radio from the case.
   - c. During class have each group draw out the schematic of the power supply and, using a V.O.M., test for A.C. and D.C. voltages.

   - d. When each group is finished with step C, have them sit down and redraw, neatly, the schematic including the voltages. Have the boy who brought the radio replace it in the case and test it, making sure it works.
   - e. Before this lesson see if any boys can bring in a V.O.M. This will reduce the group size.
4. Collect "Tube manual sheets"

Week XIII

1. Lesson
   - a. Audio output circuit
     - (1) Draw circuit on board and explain operation of a class A amplifier (50C5).
     - (2) Using 5R1, demonstrate with a signal generator and oscilloscope on how the signal is amplified through the circuit.
     - (3) Explain troubleshooting techniques for both the power supply and the audio output stage on the 5R1.
2. Class work lesson
   - a. Have boys who can bring V.O.M.'s in, do so before school.
   - b. Split into groups and have radios removed from cabinet.
   - c. Have group draw schematic of the audio output circuit, test voltages and inject an audio signal with the signal generator. Have each boy turn in a neat copy of his work.
3. Homework
   - a. Section Seven, Chapter 43

Week XIV

1. Lesson
   - a. Audio amplifier circuit
     - (1) Draw circuit and explain operation
     - (2) With 5R1, oscilloscope and signal generator, show how signal moves through circuit. With a test lead show how RP causes amplification.
     - (3) Explain troubleshooting techniques for entire audio system.
2. Homework
   - a. Section Seven, Chapter 47

Week XV

1. Review
   - a. Operation of all vacuum tubes
   - b. Power supply operation
2. Test III and grade notebooks

Week XVI

1. Lesson (Two-part lesson)
    a. Front end of superhet
        (1) Explain old T.R.F. operation
        (2) Advantage of superheterodyne receiver
        (3) Antennas and electromagnetic waves
        (4) Resonant circuits
            (a) Series vs. parallel circuits
            (b) Antenna-capacitor circuit, which one variable
            (c) Trimmer and padder capacitors
        (5) Signal characteristics in pentagrid tubes
        (6) Oscillator operation
        (7) Heterodyning signal
        (8) Obtaining I.F. signal
2. Homework
    a. Section Eight, Chapter 52
3. Review
    a. Operation of converter or mixer/oscillator stage

Week XVII

1. Lesson
    a. I.F .Stage
        (1) Review of how I.F. signal is obtained
        (2) Passing signal through I.F. Xfm
        (3) Operation of I.F. stage
2. Aligning the superhet radio (5R1 as demonstrator)
    a. I.F. cans (volume, clarity, birdies)
    b. R.F. section of gang capacitor (sensitivity)
    c. Osc. section of gang capacitor (selectivity)
    d. Use R.F.-I.F. Signal Generator
3. Homework
    a. Section Eight, Chapter 53

Week XVIII

1. Lesson
    a. Review
        (1) Operation of entire superhet front end
            (a) Converter stage
            (b) I.F. stage
            (c) Alignment
                1. Aligning radio using incoming signal
            (d) How A.V.C. and detector circuit operates
2. Homework
    a. Section Eight, Chapter 54

3. Collect semester project reports
4. Test
    a. On last day of week, give each student blank paper and have him draw on one side of the paper a block diagram of a superhet receiver. On the other side of the paper have him draw a schematic of an entire superhet receiver.

Week XIX

1. Review
    a. Free question day. Students can ask questions on any subjects covered during the semester.
2. Test IV and grade notebooks

Week XX

1. Class demonstration
    a. Layout of T.V.
    b. How to use adjustments
    c. How to adjust picture tube adjustments
2. Collect textbooks
3. Finish putting together all sets in for repair
4. Closing activities.

■

Session D

Frontiers in the Industrial Arts Area of Graphic Arts

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Since the turn of the century, elementary education in graphic arts has followed a familiar pattern. The fundamental learning experiences are centered on hand composition. Usually the student sets small blocks of copy, pulls proofs, distributes his type, and receives a grade. Through this process he is introduced to hanging indentions, inverted pyramids, justified lines, etc.

This approach has its weaknesses. Many feel that setting type is tedious and unmotivating and fails to open the student's mind and eyes to the dynamics and vitality of the printing industry. The logistics of assigning type cases and spacing material to large numbers of students presents a real problem, especially during the hectic opening weeks of the semester. Elaborate schemes, including meticulous character counts of the type case have detracted from the learning experience. Creativity and individual artistic ability may find little expression in hand composition approaches. Photocomposing, strike-on composition and adhesive lettering are widely used, and further undermine the validity of teaching hand composition to massive numbers of students.

Few can deny the inroads that offset has made into letterpress printing. Offset has brought about a need for a new and more realistic instructional technique in graphic arts. Changing employment demands are markedly affecting the preparation young people need to enter the graphic arts.

The Paste-Up Can Solve The Problem

The paste-up is an effective introduction to graphic arts, from the junior high school through the junior college and technical school. It can teach most skills learned in hand composition, plus a great deal more. It stimulates interest and creativity, and exposes the student to a variety of graphic arts theories. An introductory program should center on a series of progressive paste-ups. The student executes these at his desk, with simple tools. They are graded on cleanliness, accuracy, mechanical requirements, adherence to instructions and artistic and creative effort.

Each paste-up should teach a fundamental graphic arts theory or principle. Paste-ups can explore type size, point system, proof readers' marks, layout and design, use of ruling pen, tint screens, register marks, overlays, handling photographs, multi-color printing, etc. The list is limited only by the creativity of the instructor. He is not confined to what can be set in the type stick. The student is free to use many resources for artwork and ideas.

The paste-up centered learning experience is a valuable tool in the hands of the student and teacher:

1. The collection of exercises provides an excellent review before examinations and quizzes.
2. It is a compendium of resources and ideas available to the student after completing the course.
3. It is a job portfolio, graphically illustrating the student's abilities.
4. It teaches a salable job skill.
5. It is a tangible, creative exercise which may be taken home.
6. It provides the instructor with an objective means of grading.
7. It may be employed with a minimum amount of equipment and space.

Graphic arts is at the crossroads. It is in an era of widespread change. Graphic arts education is part of that wave. It is an educator's responsibility to keep his program contemporary and meaningful in light of modern printing technology. ■

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The first formal printing courses were offered in New Harmony, Indiana, in 1826. Early courses were vocationally oriented. With the introduction of manual training in the 1880's, many new printing courses placed emphasis on mental development rather than teaching specific *trade* skills.

Organizations participating in the early development of printing education programs were: The International Typographic Union in 1907; The International Printing Pressmen's and Assistant's Union of North America; the United Typothetal of America (now the Printing Industry of America) in 1912; and the American Type Founders in 1915. In 1935, the International Graphic Arts Education Association was formed to continue annual summer conferences, publish educational materials, and promote graphic arts educational programs. In 1965, this organization was largely responsible for a $490,000 research grant to Western Washington College, Bellingham, Washington.

The problems of graphic communications with which future generations will be faced cannot be answered through purely mechanical process and technique oriented instruction. What is needed is a broader understanding based on concepts of how we communicate—understanding of the problems of mass communications, and a realization that one of the most powerful forces affecting our industrial economy is a comprehensive understanding and use of effective communications and communications technology.

Graphic arts instruction within the scope of general education (that education designed for all—exceptional, average, boys and girls) must broaden its base to include more than the production of graphic materials. We must also consider the inter-relationships, the problems, both human and mechanical, the dependence upon scientific and socio-economic knowledge necessary for proper application. We must develop an integrated body of knowledge including English, art, social studies, science (including math), graphic arts, and technology.

Possible future directions in terms of major emphasis that can be identified are: (1) Printing education (vocational), (1) Printing arts (pre-vocational), (3) Graphic arts (industrial arts), (4) Graphic communications (expanded industrial arts), (5) Visual communications (independent field of study).

Each of these directions seems to have its place in the future of graphic arts education. The specific use of one title or the orientation of the program will be dependent on the fundamental goals of each individual school and the needs of the community.

Printing or printing technology programs stem from an occupational orientation. The future of printing technology education will reflect the more technical aspects of graphic arts such as a study of paper and inks through the use of more sophisticated instruments.

In the next ten years the industry will experience more changes and technological developments than in the past ten years. Persons employed in the industry will need more technical information in order to work with the processes of the future. This will increase the demand for precision and require the use of scientific standards.

Printing or printing arts is generally conceived to be pre-vocational in nature. This term, according to some, would still serve to identify the entire industry which is involved in laying down an image on paper. Other terms tend to confuse and obscure the fundamental purposes of printing instruction in the schools.

Objectives for this program should be:

A. Instruction for those planning to enter colleges of printing.

B. Instruction for those desiring to pursue further intensive training in the craft.

C. For those needing an entry level into a printing occupation.

Graphic arts instruction includes all methods of reproduction and allied industries. It is industrial arts oriented and as such should spend more time studying the total field, and developing in the student an interest in the area, rather than restrict study to a more narrow trade-oriented program.

Areas usually emphasized in graphic arts programs are: planning, art and copy preparation, process photography, platemaking, presswork, bindery operations and related fields.

Graphic communications as taught by Everett Worrell at Jefferson Junior High School, Rockford, Illinois, and others, considers not only printing and graphic arts, but also all phases of photography, commercial art, advertising, movie and TV production, packaging, publishing, and other techniques as well as the facets of science, economics, arts, and technologies of the graphics field.

Visual communication as developed by Ray Schwalm, could easily become a separate academic discipline drawing from all of man's knowledge relating to how we communicate.

This approach is from the point of view of analyzing the many individual methods of originating, reproducing, and handling information.

Dr. Schwalm starts from ideas and concepts relating to graphic communications and identifies necessary decisions relative to the type of audience, method of dissemination, procedures of visualizing and designing communications, then considerations relative to the production of visual materials followed by dissemination at various levels, speeds, land distances. ■

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Session E

Frontiers in the Industrial Arts Area of Crafts (Industrial)

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Each year, more and more people are becoming disabled as a result of accidents on the highway, in industry and in the home. Add to this the number of those who are disabled through birth, illness, chronic disease and old age, and the total figure becomes alarming. Accurate statistics are difficult to obtain; however, it is estimated the United States has a backlog of over two and a half million physically disabled. It is a well-known fact that our mental hospitals are overcrowded and that the incidence of mental illness is increasing.

Much concern and attention has been focused on the problem of rehabilitating these physically and mentally handicapped people, and one field which contributes greatly in this area is occupational therapy. Occupational therapy is medically prescribed and guided treatment to aid recovery from disease and injury, by use of activity—mental and physical. Some of the activity thus prescribed consists of industrial arts crafts in which the patient, through the use of tools and materials and under the guidance of the therapist, is benefited physically, mentally or emotionally.

Take for example a mental patient who has problems of hostility and needs an outlet for his aggressive emotions. He can vent his anger on something that can "take it" without damage, in the vigorous activity of forming a copper bowl with metal-work tools. His excess energy is expended and his hostility is directed in satisfying, constructive work.

This same activity could be used for another patient—one whose arm was injured in an industrial accident and has lost range of motion in the elbow, wrist and finger joints. The hammering of copper bowls, gradually increasing the thickness of metal, provides a graded exercise program. The craft activity not only helps return normal function to his injured arm, but can divert the patient's mind from dwelling on his disability.

The mental patient who fears any human contact and has lost touch with reality could begin working on a craft needing little direction. The craft activity itself can become for him a "bridge" to reality. The very act of creating something may give him the self-esteem he desperately seeks.

The crafts that are used are as varied as the numerous disabilities treated. Wood craft is adaptable to suit the needs of almost all patients. It ranges from the most detailed chip carving to the use of power-driven machinery. Leatherwork is a suitable craft for either a clinic program or for a patient confined to bed. Printing is now used in many hospitals—the hand-operated press for exercise of upper extremities; typesetting for development of coordination; block printing, using a press or mallet, and silk screen printing are all frequently used crafts.

Teachers of industrial arts at all levels should encourage their students to enter the field of occupational therapy. There is an increasing need for therapists, and those who enjoy craft work and are interested in helping others would find this profession most rewarding. ■

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The plastics industry is a rapidly growing industry. It has many implications for industrial arts and technical education. If industrial arts is to meet the challenges of this expanding industry, we must be willing to replace the typical handicraft approach of cutting, polishing, and bending plastics with courses that utilize the materials and the processes of the plastics industry.

A plastics course at the high school level should include as many of the basic forming processes as possible. It may not be economically feasible to give the students first-hand experience in all of the processes. However, a capital investment of less than $2,000.00 will provide the necessary equipment to give the students an opportunity to experience the basic forming methods of the industry.

A small laboratory-type hydraulic press with heated platens may be purchased for approximately $750.00. A small but very effective injection molding machine is available for $325.00. A laboratory-type thermoforming machine may be purchased for $720.00. Less expensive thermoforming equipment is available but, of course, it is not as versatile as the laboratory press.

A small oven, with an adequate heat range, is available for $100.00. This total expenditure of $1,895.00 will enable the teacher to include the following standard industrial processes in his plastics course:

compression molding
injection molding
reinforcing hand layup

reinforcing—pre-mix molding
high pressure laminating
solid casting—closed mold
plastisol dip casting
plastisol slush casting
casting—rigid urethane foam
expandable polystyrene
cold molding
blow thermoforming
mechanical thermoforming
vacuum thermoforming

All of these processes can be included in the program for an investment that is approximately 25 per cent greater than the cost of a good metal lathe. Those processes which cannot be included in the school program because of the excessive cost of the equipment can be presented to the students by means of films, slides, overhead transparencies and lectures.

In addition to the study of processes, the student should be exposed to the common materials that are used in the plastics industry. There are many plastic materials available and new ones are being introduced at a rapid pace. It is difficult to know how technical one should get in presenting the characteristics and applications of the many plastics that are currently available. Grade level and the objectives of the course will help establish guidelines for determining the complexity of the technical information to be presented.

In addition to the processes and the materials, the student should be introduced to the various types of tooling that are used in the different processes. Again, the technical level of instruction in this area will be determined by the grade level of the students involved. Tooling in many instances does not have to be complicated, yet it is closely allied to the plastics field and the student certainly should have a basic understanding of the elementary principles involved.

The ideal approach to establishing a plastics course in an industrial arts program would be to start with a new facility. If this laboratory were to be organized on the unit shop basis, the capital investment would be quite high because duplicate pieces of equipment would be required. In practice, however, most plastics courses are started by adding plastics to an area in an existing woodworking, metalworking, or general shop. Because of this situation, plastics is frequently taught as one area of a general shop. Under these circumstances, duplicate pieces of plastics processing equipment would not be necessary and the capital investment would be much smaller.

Thus, we have the two extreme approaches to establishing a plastics shop: (1) establishing a new facility, and (2) starting plastics as an area in an existing shop. Either approach can produce satisfactory results. ■

Session F

Frontiers in the Industrial Arts Area of Metals

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Man is only as strong as his ability to use his intellectual power to modify or adapt the materials and conditions of his environment to substitute, supplement, and/or strengthen his very limited physical power.

The assembled bits of historical information indicate that it took man, after having developed implements from natural materials, over 100,000 years to learn that the earth's crust held very important treasures that could be extracted, processed, and shaped into numerous more durable and effective protective, aesthetic, and labor-saving devices. As identity of the earth's treasures became known, man's expanding intellectual powers allowed him to process the raw materials to meet his ever-expanding needs and thus simplify some of the existing living and working patterns. The historians thus depict an evolution of changes in growth and application of useful materials. Modification of substances have progressed from the use of natural metals alloyed with other metals and on into the development and growth of ore reduction processes that have led to the numerous ferrous, non-ferrous metal combinations which are a part of our current industrial age.

The development of basic implements and later development of fashioning tools that supported the fabrication of still other needed devices, lead directly into greater and greater dependency on metals as one of the major basic materials of the culture. It therefore was natural that the industrial revolution created a mechanical world, in which man's physical power requirements have been reduced to a minimum while the demands on his intellectual powers have reached a point of dominance within this man-made environment.

Our modern technology, while still strongly dependent on metal products with special alloyed blends numbering over 25,000 and still more new ones being developed, has over the many years experienced equal phenomenal growth in other materials families such as polymers (resins and/or plastics), adhesives (bonding agents of all kinds), coatings, fuels, wood products, etc. In each of these industrial materials areas, their introduction progressed from the use of natural substances to the development of many modified and/or synthetic materials to meet the ever-increasing demands of industry. As an example, early resins for coatings and adhesives came directly from plant life such as pitch from trees or products from animals and insects. Today, however, the chemist puts at the technologist's disposal thousands of synthetic raw materials that can meet a host of industrial problems. Thus the modern technologist can reach into his materials pool for special substances that will perform modern technological tasks as never before in history. This degree of complexity and inter-dependency of our modern technological world has, therefore, impelled all participating individual disciplines and groups to develop significant insight into one another's related fields. In a recent editorial by H. R. Clauser, Editor of *Materials in Design Engineering,* he mentioned in part:

> New materials developments are expected to continue to come thick and fast. There seems to be no sign of a let-up in the increase in the number and variety of engineering materials.

He also indicated that increases in new materials do not automatically spell increased usage and progress. If we do not take advantage of the new range of substances, we may "in many ways remain technologically poor amidst our scientific materials riches." He also goes on to report that interviews and surveys revealed that a large gap still exists between the development of new materials and their respective utilization by the industrial community.

It was pointed out that these discrepancies exist because, too often, there is an unwillingness on the part of involved practitioners, to change or even take the trouble to become familiar with the tremendous added material and technological wealth that could very easily reduce or eliminate previous physical, mechanical, or human problems.

Thus, for the industrial educator to understand and work effectively in this modern industrial environment, it is extremely important for him to develop significant insight regarding the science of modern materials. The era of being concerned only with the observable forming, shaping, and/or joining problems has given way to the inclusion of a more comprehensive study of materials and environment.

Since we are the teachers of technical subjects, as well as members of a technological environment, we know that the ways of industry are no longer simple operations. *Our students must, therefore, develop greater insight into the materials they use.* They must spend more time probing and discussing the *environments* in which those substances will be called upon to work. The era of reaching for an available substance has given way to the careful scientific matching of materials to working environment. Our classes should, in some way, reflect the modern technological patterns that will ultimately help the students to understand and relate course content as a living part of the total industrial environment. To accomplish this it is important that course content include the part of the materials language that will enable students to understand most of the terms or descriptive data that are always present when industrial people discuss materials and fabrication problems.

It is equally educationally significant to include, when discussing projects, a basic understanding of the materials composition, physical properties, mechanical properties, fabricating properties, environment resistance (flexibility or limitations), chemical resistance (corrosion or destructive) and others. These are very important since such data will act as guidelines for possible successful or unsuccessful performances when the selected substance is used for the particular application. Course content incorporating added technical information and experimentation about substances used in our laboratories will enhance rather than detract from the learning climate. The necessary testing or evaluating equipment may be simple and inexpensive, yet most effective in developing the desired concepts. Activities of this nature would allow our teachers to present materials as a living part of the total educational problem. This would lead to a more meaningful bridge between industrial practitioners and the industrial arts education groups.

In a recent article by this writer, the following comments were made with reference to the future of industrial arts:

> It should also be noted that a number of engineering colleges and universities have been dropping such courses as foundry, machine shop, welding, and drawing from their program and hope to look to the high school for these offerings. This means that the future industrial arts teacher must be prepared to develop course content appropriate for the prospective engineer as well as for the student who will terminate his formal education upon completing high school. The curriculum could be revised in several different ways. The following system represents a plan to establish varying levels of instruction in industrial arts in an effort to meet the varying needs of individuals taking industrial arts courses.
>
> *1st Level: Assigned Objective*
>
> The learner is given a step-by-step operation sheet. Basically one of learning to read and follow instructions and developing certain required skills. (We may consider this a cookbook type education.)
>
> I think this would be most appropriate for students who have limited reasoning capabilities and would terminate formal education at the high school level.

2nd Level: Assigned Objective

The learner is permitted to review the assignments and note how the objective may be accomplished by exploring several methods and selecting one to follow. Understanding and working with technical equipment should not present a problem. Reading and industrial math capabilities should be requirements. This type of student should grow educationally to a point that some community college education would be possible for him.

3rd Level: Assigned Objective

This should be developed for the probing mind and should involve such judgments as: (1) Why is the assignment being considered? (2) Possible environments surrounding the suggested problem. (3) Selection and understanding of appropriate materials for the job. (4) Selection of *how* and *why* the needed operations may be accomplished. (5) General evaluation.

The student interested in the more complex phases of the industrial environment would find this avenue most interesting.

The advantage of the above system, it seems to me, is that even if taught by the same teachers, the programs somewhat clearly define the goals and as a result, clarify course content. If the industrial arts people, in general, are asked to work with the so-called low achiever, then the administrators and counselors should so indicate and the total course student should be structured to help these young people.

Industrial arts teachers represent a body of knowledge that will enable them to develop programs that will challenge students at all levels of abilities. All modern industrial teachers should, therefore, develop courses of study (perhaps in the form of separate tracts) to compensate for the wide spread in individual differences.

In a radio broadcast Gordon Routh, KCBS, passed on a few remarks that all of us associated with the industrial environment would find most meaningful. He said in part, "The man who knows *how* will always have a job; however, the man who also knows *why* will always be the boss." We would all agree that it is important for the modern teacher to display the *how* and *why* capabilities relative to his respective educational environment. This would hold true even though in some of the secondary school classes, especially when working with students having limited reasoning capabilities, the *how* is perhaps the better path to follow. By the same token, many of us would agree that most secondary school technically-oriented classes have some young people who are interested in probing more deeply into the *why* factors. ■

FRANK P. ACCURSO
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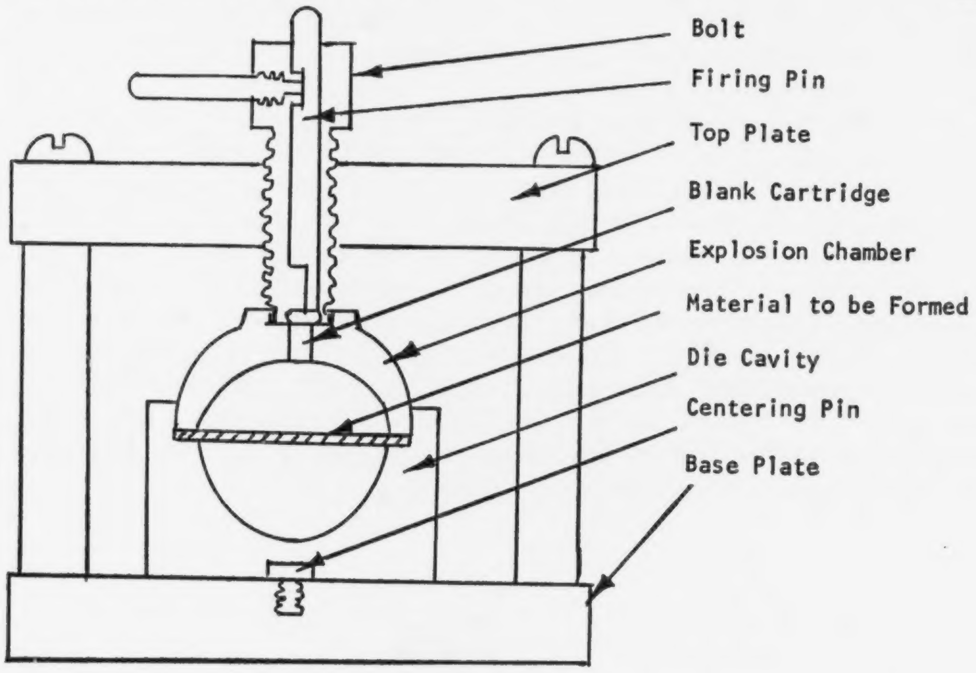
Some years ago the U. S. Air Force needed some experimental missile nose cones because existing types were burning out in the atmosphere. Air Force engineers had drawn up plans for several shapes and various companies were invited to bid on the project. One small company submitted extremely low bids, so investigators were sent to determine the validity of the bids.

It was found that the small company had two imaginative young engineers who wished to depart from the usual expensive method of producing experimental deep draws, and to try making cavity dies in the shape of the proposed nose cones, using high explosives to force the material to conform to the shape of the die.

Experiments proved that the explosive method was feasible, and the small company was awarded the contract. The actual explosive forming of the nose cones was performed at the Los Angeles city dump.

I have related this story to many of my classes, but the students were not particularly impressed until I designed and assembled a model to demonstrate explosive forming. I've used this device in several demonstrations, and student reaction and response have been gratifying.

A 59-page "High Energy Rate Forming" booklet is available for $2.00 from Reader's Service Department, *American Machinist,* 330 W. 42nd Street, New York, N.Y. 10036. ■



Session G

Frontiers in the Industrial Arts Area of Woods

DONALD LINVILLE

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The pace of advancements in science, education, industry, medicine, and in the social order today is accelerating considerably when compared with the progress recorded in previous generations. Startling results seem suddenly to explode from plateaus of normal progression to peaks of achievement . . . and virtually overnight. We experience in a decade-and-less what our grandparents marveled at over a span of a lifetime. Consider the speed of achievement from prop-plane to jet, to supersonic, to space ship . . . The short span between the arithmetic of our childhood days to the new math taught in elementary grades now . . . The brief period between what was virtual home-spun medication to the rapid-acting antibiotics of today.

Examples could be recited at long length. Permit me to select one of the modern miracles in industry, to present to you the explosions of progress which are occurring in the hardboard industry. This recital, I hope, will have a special significance to many of you, as this story of progress and usage of a most versatile material becomes part of your classroom procedure.

I will go into greater detail later to unfold the comprehensive educational program which has been developed through AIAA and our Association for use in industrial arts classes. With this program, you will be able to acquaint the adults of tomorrow with the characteristics and service benefits of a material which literally has a thousand and one uses, is expanding in scope, and which in one way or another is involved in the living pattern of everyone.

What is this all-purpose material which claims answers to so many problems?

It is hardboard . . . and it does not have all the answers to all the problems, but it has the answer to many, and considerably more answers than most of us would have expected.

I want to dispel the notion that hardboard is a paper product or something made of sawdust and glue, or is an imitation or substitute for wood. I was not merely playing with words when I said "modern miracle."

Born of research, refined by technology and engineered for specific end use, hardboard is made of wood fibers, bonded together into sheets, under heat and pressure, by the natural lignin within the wood from which it is reconstituted. It is hard. It is more dense than particle and flake boards, and has a higher modulus of rupture. These factors make hardboard commercially usable in its characteristically thinner sheets.

Hardboard has good resistance to water absorption. Hardboard has certain qualities inherent in metal-working, such as bending and die-cutting. It also shares the properties of wood, from which it is made, in that hardboard can be sawn, shaped, routed and drilled. It is free of splintering and slivering, because it has no grain and it has stability in all directions. Its smoothness and grain-free surface provide an excellent base for paint. Compared with other materials such as metals and laminated plastics, hardboard has advantages of lower cost, less weight and greater workability, without sacrificing stiffness or bending strength.

Truly, a material for a multitude of uses . . . Truly, the fruit of explosions of progress . . . And the horizon for full usage is not yet in sight.

History

Perhaps a backdrop of historical reference is of interest. Hardboard, like some other invented materials, was discovered almost by accident. It happened a little over 40 years ago, in 1924. William M. Mason was looking for a way to utilize wood residue from southern saw mills, seeking to develop something like insulation board. He determined in the laboratory that wood chips could be exploded into individual fibers by using steam under high pressure. An experimental press was developed to form a wet mat of these fibers into soft panels. Then one day Mr. Mason loaded the press, turned off the valve that fed steam to the press, and went out to lunch. When he returned, he was surprised to find a hard, dense, grainless wood panel in the press. A faulty valve had completed his discovery by supplying heat to the mat as it dried under pressure. Thus was born from nature's contribution of wood, with its thousands of years of heritage, a new product for adaptation in our new era of industrial and scientific progress which stamps this the greatest of all centuries.

In 1926, the first shipment of hardboard from a company Mason founded reached an unprepared market. What was hardboard for? Today we take it for granted. But, it wasn't created to fill any specific need. The public wasn't crying for it. No markets had been pre-developed. Yet, before long, the early hardboard salesmen, unhampered and unrestrained by any facts about the use limitations of the product, had created a healthy demand for hardboard.

The early days experienced the usual uphill problems of any new product, but movement was always upward. In 1946 there were only two hardboard plants in the United States. Today there are 22 and more anticipated.

During World War II hardboard became highly essential to the war effort and literally went to war. Wherever our armed forces went, they slept under, walked on, ate upon, rode in, used, handled or otherwise came in contact with hardboard. A significant explosion on the road of progress, as the characteristics of the material emphasized its use in tanks, trailers, aircraft, boats, trucks, hospitals, dispensaries and laboratories, to mention but a few.

The stimulant for growth into a giant industry was here. When hardboard was first put on the market, it was a plain, unlovely four-by-eight panel without much sales appeal, except as a utility material with unique service and structural properties. Spurred by competition in the marketplace, the industry came to adopt a new concept, that of an engineered wood product, tailored to specific end uses. Plants were now being located in several sections of the United States. At first, manufacturers tried to make their product an ideal base for fabrication. Then, they went on to produce specialty hardboards to meet the requirements for particular purposes and which can be sold in competition with other materials as siding, interior wall paneling, and many other applications. This development came about because of the relationship of our industry with the industrial users it supplies. At first, these industrial users made the innovations. They developed the first pre-finished hardboard tile board. They made the first perforated hardboard. Makers of radio and television cabinets developed the first wood grain finishes for hardboard.

However, it did not take long for an industry, in a very competitive situation, to see that one way to increase sales was to take the initiative in creating a demand for a product by developing new products for new applications which could be sold at competitive prices, so now there is a vast panorama of products utilizing hardboard. For the building industry alone, hardboard has siding and interior paneling and specialized products in an array of finishes, textures, decorator motifs which are limited only by imagination.

This dramatic tale will be presented in a motion picture highlighting more effectively than my words the miracles of progress in hardboard.

So much for historical review. To punctuate the progress made let me report this: When the first United States plant went into production in 1926, world production of hardboard was less than 6 million sq. ft. Today, it is over 8 billion square feet, ⅛" basis. The U. S. hardboard industry has been prominent in this growth, maintaining an annual 10 per cent-plus gain over the past decade. Domestic shipments in 1965 were two billion nine hundred million sq. ft. Members of the American Hardboard Association shipped in 1965 a total of two billion eight hundred million sq. ft., compared with the 1964 figure of two billion six hundred million sq. ft. The Forest Service of the Department of Agriculture in its recent publication, "Timber Trends in the United States," predicts that the domestic consumption of hardboard in the year 2000 will be in excess of eight billion sq. ft.

American Hardboard Association

Perhaps a few words about the American Hardboard Association might be in order. It was formed in 1952 to "Promote the use of hardboard; deal with technical and trade promotional problems; compile and publish information; extend the markets and usage of hardboard." Steadily increasing in membership, the AHA now serves 14 companies, operaing plants in all sections of the country and representing about 97 per cent of the $200 million hardboard industry. The roster of membership contains such nationally known names as: Masonite Corp., Weyerhaeuser Co., Georgia-Pacific, U.S. Gypsum Co., Abitibi Corp., Evans Products, Edward Nines Lumber Co., U.S. Plywood Corp., Superwood, and others.

Active arms of the Association are its committees: technical, production and promotional. In addition to its permanent executive secretary, the American Hardboard Association employs a full-time technical secretary, who previously was assistant professor in wood technology at the University of Illinois, and a professional public relations counsel.

Our technical committee, as in other associations, concerns itself with setting up and improving industry standards; devising performance tests and procedures, often through outside testing organizations.

Our production committee seeks new and better safety practices, more efficient packaging, loading and shipping methods and is generally concerned with the production phases of our material.

Our promotion committee, with the aid of the public relations counsel, creates and guides programs to extend the story of hardboard and its uses into the marketplace through motion picture films, brochures, publicity articles in trade and consumer press, and educational programs in which the American Industrial Arts Association is a vital part.

Working with several outside organizations, the technical committee has been cooperating with the National Paint, Varnish & Lacquer Association to develop new paint specifications and techniques for exterior application. A four-year research program with the Forest Products Laboratory is about completed involving the testing of the physical and mechanical properties of hardboard. It is also involved in projecting the benefits of hardboard as an acoustical material in combination with other materials. Highly significant for the extended use of hardboard are the favorable results from a recent fire testing program now being publicized to fire marshals, code officials, municipal agencies, FHA, lending institutions, builders and others. This report will discount several false notions about the fire resistance of hardboard and open considerably more areas for use of the material in residential and housing structures.

Board in its impact on the dealer and builder, on the fabricator, industrial user and the consumer is the work stimulated by the promotional committee. Feature articles are appearing in building and decorating sections of 2,500 of the nation's newspapers, the major shelter publications and the trade magazines in the building field, as well as the fabricating field. These articles concentrate on the uses of hardboard in the home, apartments, small commercial structures, motels, recreational and educational buildings. In remodeling jobs, farm buildings; and in the area of the handyman, too. We also are reaching the industrial markets—the furniture maker, outdoor advertising and display industry, the automotive supplier, mobile home producer and any one of 50 industrial groups who use hardboard.

Added to this full scale promotional attack are the publicity guns which will be directed in the educational field in connection with the educational program we announce today.

Spotlighting the quality of domestic hardboard and creating interest in its use, are such activities as: the Association's color motion picture, "Time of Change"; the informative booklet, "Story of Hardboard," and the dramatic and colorful brochure, "The Wonderful World of Hardboard," each enjoying exposure to millions of people. These promotional pieces are supplemented by publicity programs done by individual member companies.

Mindful of the value of broad programs for the benefit of industry generally, and lumber particularly, the hardboard industry makes a vital contribution to the conservation of natural forestry resources through its utilization of wood residue. The industry annually utilizes considerable amounts of wood that could not be used in the form of lumber, thus helping to conserve one of the nation's most important national resources.

Constant alertness is exercised in the area of hardboard imports. It is perhaps natural that foreign hardboard producers seek a share of our markets, aided as they are by relatively low freight rates, low wage rates, and equipment and production techniques equal to our domestic industry. Our foreign counterparts, starting in 1953, have constantly increased exports. Hardboard coming into this country during 1965 totaled 571 million square feet, compared with 471 million in 1964 and to about 40 million square feet in 1952.

Board is imported from Scandinavian countries, Europe, South Africa, Israel and the Far East, as well as from South America, and usually offered and sold at prices that our domestic industry finds difficult to meet. As an industry we have not sought rigid quotas or increased tariffs. However, we have made an effort to protect our industry by requesting the imposition of dumping findings where the evidence of dumping by foreign manufacturers seem to exist. In fact, under our Trade Agreement Act our tariffs have been reduced drastically. As an industry we have constantly made every effort to help ourselves.

Firmly believing that there are "plus values" in domestically produced hardboard, we instituted several years ago a promotional and educational campaign to bring to the attention of purchasers and users of hardboard the "plus values" of our products . . . which imports do not supply:

1. Continuing development of new varieties of decorative hardboards varieties not matched by imports.

2. Consistent high quality. This point is further emphasized by the domestic industry's Commercial Standard CS251-63 from the U. S. Department of Commerce—a yardstick of supervised quality control which is promoted by a logo appearing on member product identification tags and labels, literature, stationery and advertising.

3. Dependable deliveries.

4. Readily available technical assistance; constantly developed.

5. Sales aids, including national advertising, merchandising helps and point-of-purchase displays.

6. Customer confidence in well-known American brand names.

Commercial types of hardboard are: standard, tempered and service grade. Standard is substantially the same form as when it comes from the manufacturing press—suitable for applications where good machinability, good finishing characteristics, strength and water resistance are needed—furniture and cabinet work.

Tempered hardboard has been further treated by being impregnated with a siccative material and which has been stabilized by heating. It has substantially improved properties of stiffness, strength, hardness and resistance to water and abrasion. Used are: wearing surfaces, storage bins, high quality finishing, durable toys and exterior paneling-siding.

Service hardboard has somewhat less strength than standard, although it can also be tempered. It is used where its lower weight is advantageous and its moderately good workability is suitable for the application, interior paneling.

The range of hardboard available to the home builder, apartment and commercial contractor, the improvement specialist and handyman, includes numerous wood grain finishes (walnut, cherry, birch, oak, teak, etc.); perforated and die-perforated panels; three-dimensional paneling that simulates rich travertime marble and patterns embossed in such textures as diamond, louvered, wicker, cane, striated and burlap surfaces, and filigree boards. Exterior siding has boards with a variety of textures from a smooth to rough sawn timber appearance and many are protected by warranties covering durability and maintenance, even extending to a period of 25 years.

We show a steady increase in primed siding as the advantages of a factory-applied quality primer are recognized. New methods of application involving the newer adhesives and other fastening techniques contribute to the increased use of hardboard by builders. For most interior paneling, pre-finished vinyl clad and wood grained moldings are available, keyed to thae basic color of the panel.

About 20 years ago you might have found something like 100 feet of hardboard in a house under construction. And you would have had to look for it by searching under some other finishing material . . . under the finished flooring, for example.

Today, it is possible that a builder might use 2,500 sq. ft. of hardboard in a new home of average size. A great deal of it would be visible, as wall paneling in any room of the house, as siding, for soffits, lining the garage; perforated panels as working walls in the kitchen and closets and other rooms; used as sliding doors on built-in fixtures, in kitchen cabinets; for patio enclosures, fences . . . The list could be expanded to include more than 50 different places.

And don't overlook the farm market. Our manufacturers do recognize it, because hardboard is easy to work for ordinary tools, and farm owners do much of their own building. So manufacturers make available through lumber dealers detailed plans for a number of farm structures: poultry, hog and farrowing houses, bunk feeders, silo and grain bins—structures that have to weather well and take daily pounding from stock and from hard usage. Farmers use hardboard too for wagon-bed liners, grain bins, tanks, tool and fruit sheds, roadside stands and portable buildings.

One-sixth of the home use of hardboard is by the amateur craftsman or handyman who buys hardboard at retail outlets.

Hardboard can be purchased in practically every hamlet, town and city because its distribution is so well interlaced among the tens of thousands of dealers, wholesalers and distributors. A product not only extensive in its use-application but also extensive in supply.

Just a few highlights on the industrial usage of hardboard: the furniture industry quickly discovered that hardboard was an ideal material for some almost-hidden applications: drawer bottoms, mirror backs, case backs. Many furniture producers now lay up veneers on hardboard cores, frequently in 3-ply construction with veneer on both faces. Hardboard is used for dinette backs and seats, particularly when the backs are to be curved; for many kinds of tables, including card tables and heavy-duty tables for motel use; for juvenile furniture such as crib ends and bottoms, play-pen bottoms, play and feeding tables, and for buggies; for blackboards, toys, banquet tables, laboratory tables and store fixtures; furniture for hotels and institutions where hard wear is the test.

The television industry is a volume user of grained boards. Hardboard has proven ideal for signs and displays; for garage doors; in trucks, busses, railroad cars, boats, automobiles and aircraft. The electrical and electronic, packaging and shipping industries have found much in hardboard to use in specialized cases.

Educational Program

For years the American Hardboard Association has supplied speakers for schools and colleges to bring the story of hardboard to manual arts, forestry and architectural students. For many years we have been distributing to schools our 16-page booklet, "The Story of Hardboard," published in cooperation with American Forest Products Industries, Inc. More than a third of a million copies have beeen distributed and we are continuing to fill requests that follow the showing of our movie.

I think we have all become aware of the importance of reaching the next generation. This seems to us a logical way to proceed in the attempt to make everyone possible acquainted with hardboard. Your sons need little class instruction to learn the relative merits of the motor bikes and automobiles they are anxious to own. Your daughters find out quickly about a bewildering number of synthetic fabrics, because they are used in the clothes in which they are interested. But building materials have no such advantage in gaining attention. We hope that through our current program, hardboard will become thoroughly familiar to the students you reach. If we succeed, we will have exposed benefits of utility, beauty, and service which can enhance the lives of many in their everyday activities.

Hence, we announce now an educational program which will be ready for industrial arts teachers for the 1966 fall semester. This is the first time so comprehensive a program has been offered your field of education by a building product association, involving a grant in excess of $10,000. To be effective in its long range objective of helping you teaching professionals prepare the adults of the future for a fuller life, the American Hardboard Association's educational program should be a continuing activity, geared to the changing pace of industry. Thus we look forward to being partners with you for a long time.

Permit me to place before you the various elements of the educational kit which is the keystone and your implement of instruction. The educational tools are:

1. A teacher's curriculum guide, covering in text the processing and manufacturing of hardboard.
2. A supplementary flow chart which visually details the various steps involved in converting wood chips and fibers into sheeets of finished hardboard.
3. Each kit contains a jar of actual wood chips, a jar of rough fibers, a jar of fine fibers, plus a ½-inch mat (the first stage of a hardboard sheet).
4. Each kit contains a collection of 18 hardboard squares (4¼ x 3½

228

in.) showing the wide variety of types and finishes and each square is labeled for clear identity. These samples include: standard hardboard, tempered, tempered-perforated, wood-grain, primed siding, melamine surfaced, filigree, tempered sealed, vinyl, marble melamine, embossed, burlap, embossed board louver, automotive type.

5. A set of colored visual slides.
6. A copy of "The Story of Hardboard," a wrap-up in text and photo of our industry, its products and its services.

There are 2,000 of these kits available to instructors of industrial arts, created through the efforts of the personnel of the American Industrial Arts Association, including Kenneth Dawson and Jack Simich, and Karl Gettle of the University of Maryland, and members of the American Hardboard Association.

The contents of this kit have been designed to give instructors a great deal of latitude and freedom in projecting the story of hardboard, involving short or long classroom periods, as your over-all teaching schedule dictates. An interesting facet of this story about hardboard is that your students can readily explore and exploit this material because there is hardly a household which does not have ssomething made of hardboard, and generally the local lumber dealer has a sufficient inventory and displays of the product. The translation of the education contained in the kit can be found easily in the student's own surroundings and thus stimulates his own initiative for further investigation.

The joint educational program of AIAA and AHA carries also the impact of national promotion and publicity which already has appeared or will appear in the various publications in your field. In addition, through its professional public relations counsel, the American Hardboard Association will spotlight this joint educational venture in newspapers and other media with a guaranteed exposure to over 75 million readers. This is our expression of conviction in the service possibilities of hardboard and our conviction of the genuine good given our youth through industrial arts.

At your disposal for the fall semester of 1966 you now have a program of instruction that is the result of several years' work to convey to your students a simple, penetrating exposition of one of the miracle products of our scientific-industrial age—something which a student can understand and feel as the fruit of research, technology and imagination. We sincerely hope that you find this program of value as I have cited—value enough to secure a kit soon, as there are only 2,000 in supply.

I mentioned the explosions of progress which, because of their suddenness and frequency, might be jarring the pattern of life of our generation. But to your student audience these explosions are ripples of excitement and challenge—opening vistas of a fuller life. Hardboard is constantly involved in these explosions of progress. Its fascinating story is ready to be told to your students. May I urge you to give it to them now? ■

DR. WALTER C. BROWN
Director of Vocational-Technical Education & Industrial Arts
Phoenix Union High School System
Phoenix, Ariz.

DR. BILL WESLEY BROWN
Professor of Industrial Education, Northern Arizona University
Flagstaff, Ariz.

Part I

A close look at the purpose of industrial arts will indicate how well any specific industrial arts program is doing by comparing it with the recognized objectives.

If industrial arts is truly a study of the tools, materials, and processes of industry, then by definition, the major industries should be studied.

Much of the time, however, we are content to teach *as* we have been taught, and further, to teach *what* we have been taught.

As professional educators, we need to be seeking ways and means of studying the major industries of America in our industrial arts programs.

Today, we plan to describe an approach to the study of one such major industry—the concrete industry.

Just How Important is this Concrete Industry?

Did you know that more tons of concrete are used in construction each year than all steel, lumber, gypsum, brick, tile, aluminum, glass and other building materials *combined.* So widely used is this material that touches the public interest and the lives of each of us daily, that researchers say the average of *one ton* of concrete is used each year, every year, by every man, woman and child in the world!

For instance there are more than 100 uses for cement and concrete on the farm and ranch; while railroads can count 160 ways to use this versatile material. The more than 350 million barrels of portland cement produced in 1965 resulted in the employment of 15 percent of this country's total labor force. This work force supports the statistics that nearly 9 out of 10 youngsters in school today will have to earn their living by means of some technical skill through special training—yet 80 percent of the students leaving high school to find employment have received relatively little training designed to acquaint them with any industry.

A recent survey reported in the March 1966 *Engineering News Record* shows 74 percent of the members of the Associated General Contractors reported shortages of manpower and training in two or more trades.

Even the government, through Stanley Ruttenberg, U. S. Labor Department; James Duesenberry, President's Council of Economic advisors; and Arthur Ross, Bureau of Labor Statistics; all report: ". . . there are acute shortages of skilled construction craftsmen. . . ."

If Industrial Arts Education is an understanding and appreciation of industry, rather than the development of specific job competencies, then we must be concerned with curricula that will offer exploratory experience and general industrial studies to prepare students for further expanded studies in their occupational choices.

The concrete industry is one of the largest in America. No study of industrial arts would be complete without consideration of this important industry. You will hear about the history and development of this program as it evolved in Arizona. The story is a joint venture between education and industry from the planning of the textbook to the pilot student program where the text and teaching methods were tested. Also to be discussed are the area teacher-training workshops which have proved so valuable.

Based upon the success of this program, Arizona is now expanding the basic Industrial Arts Concrete Teaching Program. I believe you will find this a new and exciting area of learning experience which will be profitable to you and your students—and to the benefit of all industrial arts education!

Part II

To open this session of the general discussion, we will ask a question. That question is "How does a subject get into a school curriculum?" The answer might be—tradition, or pressures from higher institutions, or still another way—conviction and desire.

Let us use an example, woodworking. Many instructors were content to teach the rudimentary form of woodworking. A few brave souls, later, added drafting. Gradually, most major industries were represented by some form of industrial arts education. Today, we have electricity and electronics, metals, welding, leather, plastics, machine shop, auto shop, and so on. How did these come about? Mostly because someone had a vision of what could be done and decided to do something about it.

We know that industrial arts is a study of the tools, materials and processes of industry. Yet, the cement-concrete industry—as large as it is—is not included in the industrial arts programs.

But why should this subject be considered? The answer: Several direct benefits will result from a study of concrete in the curricula. First, students will develop an interest in the concrete industry. Second, they will be better educated consumers who will understand quality and therefore demand a better product from the concrete industry. Third, young people who have studied concrete and who enter the labor market will do so with a far better understanding of a knowledge basic to all jobs related to construction and allied industries. Fourth, the preliminary education in this subject can well mean the successful guidance of a young student into a specific profession in engineering design, testing, construction, architecture and other related fields of advanced work.

In 1963 a post-season workshop at Arizona State College, Flagstaff (now Northern Arizona University), called "Industrial Education Teaching Methods," brought together the Portland Cement Association and the college staff. A classroom demonstration showed how concrete could be used to make actual projects.

The success of this workshop, at which concrete was introduced as a general education subject, prompted Dr. Robert J. Turner, then Director, Technology and Applied Arts, to suggest an industry-education committee to study the feasibility of a complete teaching program for concrete as a general education subject for secondary schools.

In the fall of 1963 this committee of industry personnel and educators set out the specific needs for teaching Concrete for Industrial Arts. These were: 1) related reference information; 2) doing operations; and 3) project work sheets. *Educators* were charged with the responsibility to supply the teaching format and *industry* would supply the engineering and research aspects of the technical subject—concrete.

Another problem arose. How do we know teachers will want to include a new subject like concrete in their already loaded curriculum?

In 1964, Dr. Bill W. Brown, Acting Director Technology and Applied Arts at ASC, introduced a tentative program and textbook format to more than 100 at the Summer Industrial Education Workshop. The overwhelming enthusiasm indicated that such a subject would be a welcome addition to existing I-A programs.

The preliminary text material was developed and prepared by Dr. Brown of NAU, Lee Myers and George White of the Portland Cement Association. Then a pilot teaching program was organized by Dr. Walter Brown, Director of Industrial Arts, Phoenix Union High School System; in cooperation with Bill Anderson, Industrial Arts Dept. Chairman and Richard Boone, instructor at Camelback High School, Phoenix. Twenty-nine 9th grade general shop students participated in a two-week (10 hour) pilot class.

The practical aspects of establishing the classroom teaching procedures, and equipment costs were studied. A comprehensive evaluation of the text material was also accomplished. During this pilot program educators and industry personnel observed the work and reaction of the students. A complete pictorial record was made during class sessions to be included in the revised and up-dated textbook. This program was the first of its kind in the nation, so you can imagine how interested we were in the outcome.

The course of study included the three main areas of most good I-A courses: 1) lectures covering related information, 2) doing units in the form of demonstrations and experiments, and 3) the making of projects to reinforce the learning process. Industrial films were also presented. Throughout the entire pilot program the class was introduced to and governed by a personnel plan similar to that used in industry.

The final phase of the course involved the mixing, placing, curing and completing actual projects of concrete. The prime purpose of the projects was to reinforce the learning habits derived from the "Do Unit" demonstrations and to produce a project that would meet specifications that were pre-established.

To determine just how clearly and carefully the new information had been retained by the students, a final written examination was given to cover the basic content of the course. The outcome was most successful and encouraging and gave evidence that the course of study and methods of instruction were well presented.

Careful evaluation and results of the pilot program indicate that a course in concrete technology can become an important part of the industrial arts curriculum and instruction in this new field will fit in with existing wood labs using many of the tools and materials available, thereby keeping the costs very nominal.

The pilot program indicated that two weeks is not adequate to complete the technical-related material, experiments and projects necessary for a total program. A minimum period of four weeks is necessary to teach a unit in concrete. The text is arranged so that this minimum can be expanded to include a full semester course.

Grade level of students showed that 9th-graders respond well to this program and we concluded that this instruction could be a part of the total industrial arts program from this grade level through college and extending to adult education classes.

An unsigned evaluation sheet filled out by each of the 29 students indicated some interesting comments: 69 percent would recommend this program to other students not in I-A; 70 percent found the class interesting and informative; and 97 percent liked doing the project.

Using experiences from this pilot program, the textbook, instructors guide and teaching format were revised to incorporate the new experiences gained in the actual teaching situation.

The new 74-page illustrated textbook is now available on order from Toney-Wedge Publishing Co., 804 North 4th St., Phoenix, Arizona ($2.50 ea.). It is divided into four sections. The first three sections indicate how the text fits into the industrial arts philosophy:

1. Section I deals with related information—information that is nice to know but not necessarily essential to the learning process.
2. Section II is the basic part of the text. These "Do Units" are essential to the learning processes.
3. Section III is devoted to classroom projects to reinforce the "Do Units."

4. The function of Section IV, "Reference Information," is to complete a package program that will meet the requirements of a good Industrial Arts curriculum. Here, the student will find a new vocabulary; procedures for making working drawings and sketches; and safety tips for laboratory work. Outside reference sources and job opportunities in the concrete industries are included.

The student textbook is supplemented by an *Instructor's Reference Guide*. This guide is a compilation of auxiliary information designed to help you, the instructor, teach the course. Included in the "Teaching Guide," are sample quizes, educational reference material, films and auxiliary teaching aids.

After completion of the student pilot program and revision of the textbook material, a special two-week "Workshop" was opened at Northern Arizona University in the summer of 1965. The purpose of the summer course was to teach industrial arts Instructors how to present the new "Concrete" course to their high school students. Thirty-three educators from the western area of the country attended. The interest, enthusiasm and results proved to us that old traditional barriers to new studies have been penetrated to open up new fields of exciting studies in concrete. As one instructor said, "It's about time that a concrete course was offered. I think that it is more useful to students than some other courses offered for many years.

How can a course in basic concrete be initiated in your school system? One of the easiest ways is to follow the example of the Phoenix Union High School System as administered by Dr. Walter Brown and his staff.

1. Set up a basic planning session. Invite system staff and sponsoring agencies such as State Universities or Colleges and concrete industry representatives as the Portland Cement Association.
2. Outline training course and procedures.
3. Send a letter from School System Director to principals indicating an "information meeting" for all interested instructors who want to learn about this new instructional area of concrete.
4. Schedule classroom space and laboratory equipment. Select teaching staff for *instructors workshop*. Hold training sessions. For the Phoenix area, three Saturdays were scheduled from 7:00 a.m. to 1:00 p.m.
5. Follow-up the Instructors Workshop by using publicity and announcements to encourage teachers to initiate the program in the classroom.
6. Initiate course in your school with administrator and school board approval. Contact outside groups for films and related materials, guest lecturers, field trips and actual materials used in the program.
7. Periodically evaluate the programs and upgrade accordingly.

8. Give talks on successful programs at your State Associations and special teacher groups.

Industrial Arts Education is a teaching discipline that is lacking a vital part—concrete. As key people, you should tell your students and your community that something new is on the educational frontier—something that will make the industrial arts program more complete—a firm determination to teach the tools, materials and processes of one of the largest industries—concrete.

Materials with which you can work are readily available, materials tested in the classroom by students and teachers. Supplemental teaching guides with classroom scheduling, lesson plans, visual aids and support materials for effective, meaningful teaching are at your fingertips. The national organization of the Portland Cement Association with representatives in most every state of the United States and province of Canada stands ready to help you. The cement and concrete industries in your local area—local business people are available to help you with supporting materials and ideas. Be the first in your system to initiate this new exciting program. ■

Session I

Industrial Arts' Contribution to Multi-Discipline Programs

RICHARD A. FROESE

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Phoenix, Arizona

In conventional industrial arts classes all the learning activities take place in the shop or laboratory. This means that when an instructor is giving lectures, showing films, testing, or carrying on a discussion of text assignments, the students sit around their benches or assemble in a lecture area of the shop. While these activities take place, all of the expensive equipment that goes into the makeup of a typical industrial arts shop stands idle.

The experimental class we have been having here at Maryvale High School in Phoenix, Arizona, has been tried in the hope of doing away with this idle equipment problem, relieving the crowded shop situation, and perhaps in the long run providing a more comprehensive and effective course.

In the standard rotating general shop of most schools, there are usually four groups of approximately 30 students each, assigned to four different shops and then rotated every nine weeks. This takes care of 120 students, using four shops and four teachers. All activities take place in the shop. As in most high schools, the general shop program at Maryvale High School is for freshmen.

With over 1000 students signed up for all levels of industrial arts out of approximately 1250 boys (total school population in 1965-66 = 3300), we decided to try our experimental class with the freshmen of one section of our general shop. We kept one section with four groups of 30 each to run through a regular general shop set-up as a control group.

The 200 students in the experimental group were divided into two groups, *A* and *B*, of 100 each. These groups were divided in turn into four groups of approximately 25 each, according to ability level. This ability level was determined by the students' scores on the differential aptitute tests related to industrial arts, averaged together with the score of a diagnostic test developed by the industrial arts teachers.

The four groups from the *A* group of 100 are placed in the four areas of wood, metal, electricity, and drafting, thus making smaller shop class load. Meanwhile the other group of 100, *B*, meets in a large lecture room. Here the 100 students under one teacher and a few student assistants are informed about all areas of industry, materials, occupations, and related materials. This is done by way of films, lectures, discussions, and textbook assignments.

The next day the large groups switch and the *A* group of 100 comes to the lecture room and the *B* group divides into the four shop areas. This alternating continues for the year. The shop groups rotate every nine weeks, thus providing each student in a year's time a total of 22 *work* days in each of four shop areas and 88 days in the lecture room.

Now that we have gone through a little over three-fourths of the year we are able to draw some conclusions. We gave a retest of the diagnostic test given the first of the school year that helped determine ability levels. The results showed very little difference with the average groups; but showed that the high level students in the experimental group improved their grades by a higher percent and the low level students in the experimental group improved a great deal more than the control group.

Student reaction to this experiment was one of general dislike of the lecture system. They would rather work in shop. Teacher reaction indicated that there was a poor carry-over of knowledge for the student on an every-other-day basis. The teachers also felt that in the shop areas, they did not get to know the students or their work. A better proportion of work to lecture seemed to be needed, but was not possible because of schedule difficulties.

Some advantages of this program were that it gave less paper work to the shop teacher, provided smaller class size in the shop yet created a larger teacher-pupil ratio (200 students, 5 teacher = 40 to 1). The disadvantages indicated that control of discipline was difficult. High school freshmen are not yet mature enough for large group instruction. Student assistants were helpful but not mature enough to handle students. The physical set-up is quite important and a properly sized and shaped room is necessary for the best use of the lecture method. We plan to modify our program next year by going back to regular general shop method with occasional use of a large lecture room for films and lectures to all general shop students at one time. ■

PATRICIA KNOWLES

Crestmoor High School, San Mateo Unified School District
San Bruno, California

Have you ever faced the question, "How do I help my lowest students to try again?" What method works with teen-agers who do not care, do not try, and do not even understand the need to be able to communicate facts and ideas?

Cloyce Frazer, industrial arts, Cal Davis, mathematics, and Pat Knowles, English, all teachers at Crestmoor High School in San Bruno, have found an approach that works. Forty-six students chosen from a group of volunteers because they fit into the low ability and motivation category, are trying work in mathematics and English into projects in applied arts. In a classroom adjacent to the wood and metal shops, each student describes what he will make, often rewriting with teacher help, and sketches and computes the cost of his project before touching a tool. When his project is completed, he evaluates his work in writing and analyzes labor and actual cost data. Both teachers and students enjoy this process.

Several contrasts between this and a regular classroom situation are obvious to the observer. The program was designed to create a different atmosphere from that students usually encounter. No one must stay rigidly in one place. Movement between different stations, seeking help from various teachers and teaching assistants, is the more usual pattern. The work available generates high student interest and the route a student must follow in accomplishing it puts him in the unaccustomed position of seeking help from a teacher rather than being the uninvolved recipient.

Individual attention is perhaps the most important portion of the formula. Students who are used to failure often need a teacher's interest as much as his academic knowledge. In this program each student receives individual attention regularly.

Ten non-readers are being tutored in class each week. Each of the remaining 36 students is involved in one or more weekly seminars working on specific English problems diagnosed in his writing. A similar approach is used to give supplementary work in mathematics. The two-hour time bloc with the teaching team present for both periods is what makes this approach possible.

The format for the present program, now in its first semester as a regular school year offering, has come from a four-week experimental session held last summer. Very few changes have been made in that program which parents and students received so enthusiastically, but they have been of major importance. One of them is recognition that this type of student requires a more structured environment than we had anticipated. A ladder of projects in wood, metals, art metal, embroidery and art will go into effect as a guide in the near future. As a student masters the skills needed to complete the simpler projects, he will be allowed to advance. An increasing emphasis on crafts projects is also evolving. Much of the special work being done is possible only because of the three capable teaching assistants and a student teacher who enthusiastically work on a special adaptation of this program to the auto shop. Student discipline, much less of a problem here than in the usual classroom, is handled largely by an elected rules committee composed of students with a teacher adviser. In this case the teacher is really an adviser, not a decision-maker. One of the harshest student-devised punishments is suspension from the shop. Attempts to increase communication between the home and the school are being made by the Family Service Organization.

Those who are interested in having specific questions answered or who would like to observe the class in session are most welcome to inquire at Crestmoor High School, 300 Piedmont Ave., San Bruno, California. ■

How We Get the Industrial Approach Into Industrial Arts in Our Region

Report: East Coast States

HERBERT SIEGEL

New York City Public Schools

Brooklyn, New York

Panel: "Is There Industry in Our Industrial Arts Programs?"

Problem: "How We Get The Industrial Approach into Industrial Arts in Our Area, East Coast States"

This questionnaire was mailed to the ten largest school districts in each of the thirteen eastern states. Of the 130 questionnaires mailed, 86 school districts replied. The school superintendents were requested to have their director of industrial arts complete the questionnaire. Each school district was to be considered as a single unit and the directors were to indicate the most successful methods used to introduce industry into the industrial arts shop.

School District	*Enrollment*
Connecticut	
Hartford	25,100
Bridgeport	24,400
Stamford	17,400
Norwalk	15,000
New Britain	14,600
East Hartford	11,000
Delaware	
Wilmington	15,100
Newark	8,900
New Castle	5,100
Camden	4,800
Milford	2,700
Claymont	2,600
Laurel	2,000

School District	*Enrollment*
Maine	
Bangor	7,500
South Portland	5,600
Lewiston	5,200
Auburn	5,000
Augusta	3,900
Oldtown	3,700
Presque Isle	3,700
Brunswick	3,500
Caribou	3,200
Maryland	
Baltimore	186,600
Towson	102,800
Rockville	100,200
Upper Marlboro	92,600
Annapolis	51,600
Hagerstown	21,700
Bel Air	20,000
Cumberland	17,000
Frederick	16,100
Massachusetts	
Boston	98,600
Springfield	31,500
Newtonville	18,100
New Bedford	15,500
Fall River	13,300
Somerville	13,000
New Hampshire	
Manchester	13,000
Nashua	6,800
Concord	5,100
Keene	3,900
Dover	3,700
Derry	3,000
New Jersey	
Newark	72,200
Jersey City	35,000
Camden	20,000
Woodbridge	20,000
Elizabeth	14,900
Clifton	12,700
Middleton	11,200

School District	*Enrollment*
New York	
Rochester	42,400
Syracuse	31,800
Yonkers	27,800
Kenmore	21,900
East Meadow	18,500
Albany	13,700
Elmira	13,500
Pennsylvania	
Philadelphia	264,500
Pittsburgh	74,200
Erie	21,900
Bethlehem	15,000
Reading	14,800
Harrisburg	13,900
Rhode Island	
Providence	27,600
East Providence	8,000
Newport	6,100
Vermont	
Essex Junction	3,000
Rutland	2,900
South Burlington	1,900
Montpelier	1,800
Virginia	
Fairfax	80,700
Norfolk	55,700
Richmond	43,600
Virginia Beach	29,600
Arlington	26,900
Hampton	22,700
Roanoke	19,800
West Virginia	
Charleston	60,200
Huntington	22,100
Parkersburg	18,200
Fayetteville	16,800
Clarksburg	15,800
Fairmont	13,000

SUMMARY SHEET SHOWING FREQUENCY OF TECHNIQUES USED

	Used Frequently	Used Occasionally	Used Rarely	Total No. Sch. Dist. Reporting
I. *In-School Activities*				
A. Demonstration Lessons				
1. Tool Techniques	84	2	0	86
2. Relation of industrial practice	56	15	1	72
3. Pupil personnel plan	60	9	3	72
4. Production records	20	36	26	82
5. Time cards	8	19	39	66
6. Use of blue prints	64	18	3	85
7. Use of job sheets	52	26	6	84
Total	344	125	78	
Possible responses—602				
Responses received—547				
B. Industrial Information Lessons				
8. Pupil reports	33	41	9	83
9. Industrial folders	8	43	22	73
10. Occupational folders	18	35	21	74
11. Products folder	19	34	18	71
12. Pupil notebook	50	26	5	81
Total	128	179	75	
Possible responses—430				
Responses received—382				
C. Other Shop Activities				
13. Mass Production Projects	13	44	23	80
14. Junior Achievement Company	6	15	46	67
15. Planned Audio-Visual Programs	50	30	2	82
16. Use of Industrial Safety Posters	60	18	2	80
17. Research and Development Teams	7	28	6	41
Total	136	135	79	
Possible responses—430				
Responses received—350				
D. Guest Speakers (Auditorium or Shop Program)				
18. Representatives from Industry	14	48	15	77
19. Parents, working in Industry	3	36	40	79
20. Industrial Displays	20	34	15	69
Total	37	118	70	
Possible responses—258				
Responses received—225				

	Used Frequently	Used Occasionally	Used Rarely	Total No. Sch. Dist. Reporting
II. *Out-of-School Activities*				
A. Visits to industrial plants				
21. 44 shop classes make one visit per term				
22. 10 shop classes make two visits per term				
23. 17 shops classes make three visits per term				
Total				71
Possible responses—258				
Responses received— 71				
III. *Up-dating Shop Equipment*				
24. 63 New equipment installed within the past year				
25. 37 New equipment installed in the last five years				
26. 25 New equipment installed in the last ten years				
Total				125
Possible responses—258				
Responses received—125				
IV. *Teacher Contact with Industry*				
27. 16 Program sponsored by Industrial Arts Office to encourage teachers to work in industry (Summers—Sabbaticals)				
28. 73 Teachers find their own job in industry during the summer				
29. 8 No attempt is made to have teachers renew their experiences with industrial procedures				
30. 38 Teacher Association visits to industry				
Total				135
Possible responses—344				
Responses received—135				

Report: Central States

OSCAR F. HAYNES

State Supervisor, Industrial Arts Education, Department of Public Instruction
Indianapolis, Indiana

When I received a letter from Leonard Glismann last November regarding my presentation of this topic at this convention, I was, to say the least, very hesitant about accepting the task. This letter became one of those you keep moving to the bottom of the pile, one of pondering your response, reluctant on the one hand and anxious to accept on the other. Such questions as where could I obtain information to accurately report on this topic arose. After much deliberation, I accepted the challenge and set out to gather the information. May I say now that the plea for information from all the people was well received, and without their help this presentation would be impossible. My personal thanks to each and every one of you.

The information presented here is a composite of responses from leaders in industrial education from the following states: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, Oklahoma, South Dakota, and Wisconsin. Many of the persons contacted surely used many hours of valuable time to write their responses. In gathering an accurate picture of "How We Get the Industrial Approach Into Industrial Arts in Our Area, Central States," I wrote letters requesting leaders in the field of industrial arts to respond in terms of:

(1) tools and machinery
(2) curriculum
(3) teaching methods
(4) related activities; such as field trips, audiovisuals and/or others.

The responses indicate the following general trends in industrial arts in our section of the country:

In the area of tools and machinery, there are indications that we are making significant gains in updating our laboratory equipment to more closely represent those used in industry. This is not to say we have gone toward automation, but tools and machines which have the production potential of those in industry are commonplace.

One state, Iowa, is reported to be using equipment for "printed circuitry." Machines for production printing are not uncommon, machines with advanced safety features are found, up-to-date hand tools and small electric tools are replacing more obsolete ones, a turret lathe in an inindustrial arts laboratory indicates that we are trying to represent industry accurately by providing learning experiences with a high percentage of industrial use.

This is not to say we are constantly tooling and retooling. School budgets—taxpayer money—just do not permit the necessary funds for this type of expenditure. By and large, we are making significant gains in the area of tools and machinery and are more accurately representing industry in this respect.

In the area of curriculum, I find we are really on the move in the "Middle States." Ask a student of a good industrial arts program the real meaning of mass production, quality control, cost analysis, product design, stockholders, industrial management, unit cost, down time, piece work, labor union, product improvement, marketing, distribution and many other terms related to our industrial society, and you are likely to get a pretty accurate answer. In some programs such phrases as fixed cost, capital outlay, stock dividends, potential market, sales promotion and other terms are commonplace. This is probably the most uniform response from the entire area. Nearly all the reports indicate a newly incorporated unit on mass production being initiated in our industrial arts programs, even at the junior high level. These programs are being initiated, expanded, evaluated, tested, and it appears to be one of the most gratifying units in terms of student understanding which we are undertaking. There are several programs being promoted in this area with variations. One of these you will be reading about in the May issue of *Industrial Arts and Vocational Education* magazine. This program, promoted by Dr. Yoho at Indiana State University, uses an orchestrated approach to understanding our technological society.

It is apparent that most of our middle states are expanding curricula offerings to provide experiences in woods, metals, drafting, plastics-ceramics, electricity-electronics, graphic arts, and power mechanics. This fact alone has caused tremendous growth in terms of numbers taking industrial arts and in the all-important area of qualified teachers. There appears to be a deterrent to further expansion of industrial arts offerings due to the lack of qualified teachers. We are 67 teachers short in Indiana this year, and the prospects for the coming year are even more bleak. This is another topic, but we must take unified steps to correct this situation!

In the area of teaching methods, the responses were not detailed enough to get a totally accurate picture. Responses indicate that there must be innovations in this area along with the incorporation of new teaching-learning experiences. We are having new approaches and teaching techniques.

Teachers are trying different methods. Several reports indicate a new type of experimental program where the more able students are allowed to test, evaluate, write reports, etc., on a particular material or subject. Several of these programs are designed to challenge the more gifted and scientific students. The pupil-teacher ratio is smaller and, therefore, provides more time for individual guidance and direction.

Other areas indicate that teachers "teach as they are taught," and not much is new in the way of innovative approaches. Probably the best of the more recent developments in the representation of industry is the individualized research type program which very accurately represents what industry is doing. In West Lafayette, Indiana, at West Lafayette Junior High School, such a program was initiated and met with such favorable results that parents requested the program be continued in the high school. In an appearance before the local school board the parents of students involved in this program were given assurance that this type of activity would be continued in the high school. The applications for the class have been overwhelming.

In the area of related activities, the portion of varied approaches to the interpretation of industry, we find that the field trip is more frequently mentioned than any other. I do believe that these are conducted with more thought given to the learning experiences than was formerly used. The usual pattern is for the class to set up a list of criteria or objectives of the trip; and, thereby, have a better understanding of what to observe when the trip actually takes place. This, coupled with an evaluation and follow-up discussion, results in a better understanding. It is not too difficult to imagine the understanding gained by the visitation of a manufacturing plant before and after a unit on mass production. As a result of actual participation in such a unit, little is left to the student in the way of inferred understanding. In other words, more of the "guess" is taken out of the desired learning, and a more concrete concept of a manufacturing industry results.

In the area of audiovisuals, we are gaining. We usually find a very decided increase in both the number and variety of these aids being used. Learning units are made more vivid, understanding more complete, topics more interesting, scope and variety of materials and processes are more accurately presented to our students than ever before. The decided increase in the use of films and filmstrips has had a very definite effect on our programs. Some school districts report having their own film library with a rather complete catalog of these materials. Others rely on the regular services and industries for their supply. I feel this particular aspect of our curriculum will take on added emphasis with the interest in materials of this nature and funds being made available through Public Law 89-10.

In this report I have tried to represent accurately the consensus of those people reporting for me. The fact that this paints a pretty good picture of what we are doing to interpret industry is somewhat misleading. This stems from the fact that these were taken from our larger population centers, and the smaller schools have very little representation in this report. We do have some programs which tend to be traditional in both curricula and teaching methods. Indications are that these are becoming fewer and are being strengthened at every turn. It is my contention that if one of our objectives is to remain "an interpretation of our industrial society," we must work diligently to improve our programs to meet this objective.

The following people contributed to this report, and to these my very sincere thanks.

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Dr. Bryant Crawford, Jr., Chairman, Industrial Arts Education Dept., Central State College, Wilberforce, Ohio 45384.
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Report Mountain States

STEPHEN W. MINDOCK

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This report is based on information received from supervisors, directors, coordinators and teacher trainers of industrial arts in the mountain states. Fortunately, two years ago the Mountain States Conference on Industrial Arts was formed in Salt Lake City. I attended this conference last fall and it proved to be one of the finest professional experiences in my career. There were 36 educators in attendance, nearly all either supervisors or teacher educators of industrial arts. Through this group I made contacts to receive information on industry. Twenty-five requests were sent out, 20 replies came back.

"How do we get the industrial approach into industrial arts?" By industrial approach in industrial arts, I would assume is meant anything taught in industrial arts classes, or any influence which provides students with an understanding of industry. To be more specific, the first objective of industrial arts as formulated by the American Council of Industrial Arts Supervisors should be used as a basis for determining what the industrial approach means. This objective states: "To develop in each student an insight and understanding of industry and its place in our society."

No doubt there are many individuals who are making a sincere effort to provide their students with an understanding of industry. In fairness to them, it should be pointed out that time did not permit a comprehensive survey of all industrial arts teachers in the Rocky Mountain States. It is perhaps true that there are in operation today as many different efforts to incorporate the industrial approach as there are men teaching industrial arts. It is hoped that information obtained from teacher educators, supervisors, directors and coordinators of industrial arts will give a fair sampling of what is being done in the mountain states to bring industry into industrial arts.

In some cities, industrial arts and vocational education are carried on in comprehensive high schools. When the instructor is qualified to teach both, his trade experience represents industry. The degree to which this experience is used to help students understand industry depends on the individual instructor.

On the other hand, in cities where vocational-technical schools or community or junior colleges exist, the high schools would be more apt to have only industrial arts offerings. In this case industrial or trade background of instructors would be limited.

A look at the states of the Rocky Mountain Region in the ensuing reports shows an encouraging amount of over-all experimentation and innovation of new programs. It appears cooperation between teacher-training institutions, public schools, and industry has begun to emerge. This is a forward step toward maximum incorporation of an industrially-oriented industrial arts curriculum in our schools. Reports are presented here in a summarized and condensed form.

Utah. A "big push" was made this year to do more about mass production. A university class was offered to develop some understanding and techniques in the classroom. About one-third of the teachers attended 12 two-hour sessions.

A television program on mass production has been developed by the State Department of Education and Utah State University. It was produced in a ninth grade woods class. A kinescope of the television program was available this month. The film will be made available next year to all schools in the state. The purpose of the film will be to challenge all departments to produce at least one mass production project next year.

Utah State University in its teacher training program is stressing the mass production technique. Coordination has taken place between the university and junior and senior high industrial arts teachers. Working now in developing a unit or course in mass production are Dr. Neil Slack and industrial arts teachers.

Some schools make field trips but more request industrial personnel to come into their classrooms. This is especially true in electronics and drafting.

A new plan on cooperative teacher training between industry and Utah State University was started last summer and will be continued this summer. The purpose of the plan is to provide teachers with industrial background. All freshmen, sophomores, and juniors have been invited to participate. Following their selection, they will attend school during the academic year after which they will be placed and supervised in an industry closely related to the area in which they plan to teach. This has been initiated and promoted by the Utah Manufacturing Association Training Committee with staff members of the industrial arts department, Utah State University. It is hoped that this will be an effective way of getting industry into the schools as well as gaining support from industry for the teacher training program.

Arizona. J. J. Littrell, Arizona State University, presented an interesting idea on our topic. He said, "Teachers may effect the industrial approach in part through assigned readings in textbooks and references, through films, or whatever means are available. It may then be as much of a student attitude as it is a teaching technique."

Following are some of the things Arizona's teachers are doing relative to the industrial approach. There is no general practice of these activities but individual schools and/or teachers are trying them.

1. Two-hour or double periods for advanced industrial arts classes.
2. Work experience plans where advanced students are placed in garages for two or three hours per day.
3. Production projects for the school system involving lockers, music stands, athletic equipment, concession stands, and shelving.
4. Mass production projects, usually small items.
5. Field trips to copper mines or local industry.
6. Frequent use of resource persons.

Many industrial arts teachers have trade background. Several have been vocational teachers at other schools or in other states.

Walter Brown, Director of Vocational-Technical Education and Supervisor of Industrial Arts in the Phoenix Public Schools, presented four major activities implementing the industrial approach in the Phoenix system.

Advisory committees for specific industrial arts areas have been formed. This enables instructors to discuss their areas directly with representatives from industry and to obtain better understanding of what industry regards as important to stress. Purpose of these advisory committees is to orient industrial arts programs to current industry.

An in-service instructional improvement program is operating in the Phoenix High School System in which four half-days per school year are spent on improvement of instruction. Utilizing speakers from industry, outside resource persons and industrial arts instructional staff members, these meetings have helped in realizing the goal of emphasis on the industrial approach.

The director of industrial arts meets periodically with department chairmen in each high school. Part of each meeeting is devoted to curriculum discussion with emphasis on the industrial approach. Outgrowth of these meetings has been a pilot program for a general shop in one high school and general concern on the part of department chairmen for stress in curriculum other than the project.

Special summer workshops for teachers have resulted in course outlines and resource units for every industrial arts course taught in Phoenix. The concern is to incorporate the industrial approach into all industrial arts subjects. Several units have been developed for the general shop program. Through supervisory visits emphasis has been placed on the philosophy of the industrial approach when working with individual teachers.

Tucson, Arizona: In the Tucson Public Schools 87 industrial arts teachers were surveyed for trade background by Dr. Bazzetta, Industrial Arts Coordinator. The following results were obtained:

Trade Background	**No. Teachers**
Less than one year	9
One year but less than two	9
Two years but less than three	20
Three years but less than four	16
Four years but less than five	7
Five years but less than six	6
Six years or more	21

Dr. Bazzetta pointed out a number of other activities taking place in Tucson to promote the industrial approach.

Thirteen industrial education teachers are qualified to teach both industrial arts and vocational education. An attempt is made to hire high school teachers in industrial arts with trade experience.

The high schools all have well-equipped unit shops. Since some of these shops are used for both industrial arts and vocational classes, industrial type equipment is available to industrial arts students.

Some automotive instructors have required that students in groups of three or four visit garages and then give class reports. Field trips to industry are always encouraged. Due to double sessions and long school days, however, it is not possible to do as much as should be done. Several buses have been secured for this purpose and more trips are planned for the future.

Mass production projects in industrial arts classes are limited. Production work is done on cars, in photography, and in the print shop classes. These production jobs are controlled. They must be of educational value, must fit into the specific instructional program, must be approved by the teacher and principal, must be student work, and sufficient time must be allowed to complete each job.

High school industrial arts classes are two hours in length. These classes have a strong "industrial flavor."

Montana. In Montana industrial type machines are used in many industrial arts classes. Shop organization and safety programs patterned after industry are used. Mass production is stressed along with visits to various industries where proximity from school to industry is feasible. Visual aids of all types are utilized on related information about industry. Industrialists, tradesmen, and union men are asked to speak to industrial arts classes.

New Mexico. An interesting survey made in 1962 on the number of years industrial arts teachers worked in industry was made by Richard Warner, Industrial Arts Professor, The University of New Mexico. The survey produced 67 responses. One person had 30 years of experience in industry while a majority of the industrial arts teachers had two years or less of work experience. Over 51 per cent of the 131 persons who answered the questionnaire had some type of work experience in industry. Trade background of industrial arts instructors and use of related information movies about industry are the strongest points that can be made for the industrial approach in industrial arts.

The physical plants are much improved. The equipment is basically the same throughout the state and is similar to that used years ago.

Colorado. Industrial arts teacher-educators from Adams State College, Western State College, Colorado State College, and Colorado State University report the following on the industrial approach in industrial arts.

Most of the small schools in the state do not have a real industrial approach to industry. Field trips, teacher experience, guidance pamphlets, and talks by men from industry are limited. In some cases notebooks on industry are made up by the students.

Larger schools do much better but there is no well-defined plan. They add information on labor unions, worker organizations and make more use of field trips.

Other activities:

1. Trade magazines in shop libraries with suggested or assigned readings.
2. Study of occupations.
3. Use of speakers from industry coupled with field trips.
4. Related information films.
5. Mass production projects.
6. Drafting assignments reflecting procedures of industry related to drawing and design.
7. Woodworking classes teaching veneering and bending of woods, similar procedures in industry.
8. Computer drafting institutes.
9. Utilization of families of plastics versus the old acrylic approach.
10. Personnel organization that parallels industry.
11. Experiences in all basic types of reproduction.
12. Demonstrations on new ideas and techniques by representatives of industry. (This is especially true on automotive equipment and by plastics suppliers.)
13. Use of the testing bench to cover strength of materials, similar to industry's metallurgy and quality control systems. (Colorado State College.)
14. Use of electronics programed instruction and testing system for teaching electricity and electronics, prevalent in industry. (Colorado State College.)

Pin-pointing the over-all philosophy of teacher-trainers at Western

State College in this quotation of J. M. Irwin: "We want to teach students to recognize, understand, create, and communicate with industrial processes and materials—to think industrially. Along with industrial processes, we strive to cultivate analytical, imaginative, constructive minds to further skill and creative ability. This, we feel, is the key to a student's success in any industrial endeavor."

In Colorado Springs we have three comprehensive high schools employing 22 industrial education teachers. Ten of these teachers teach both industrial arts and vocational subjects. This is our strongest area in bringing industry into industrial arts.

In addition the industrial arts instructors in the six junior high schools are continually encouraged to experiment with mass production. Each year several classes utilize mass production projects. Limited use has also been made of speakers from industry and field trips.

Emphasis on the industrial approach takes place during monthly curriculum meetings of all junior high industrial arts instructors.

Students in the three graphic arts high school shops make annual visits to the International Typographical Union in Colorado Springs. This month a tour has been arranged for members of the Colorado Industrial Arts Association through this facility during their annual convention. On a statewide basis there has been success and cooperation from the Rocky Mountain Club of Printing House Craftsmen, Printing Industries of Colorado and the Colorado Press Association in sponsoring Printing Week. This year these organizations sponsored an essay contest on "The Importance of Printing in Modern Day Living."

Our three auto mechanic instructors who teach both industrial arts and vocational subjects have attended trade schools such as the General Motors Training Center in Denver. Many others teaching industrial arts have trade experiences varying from six months to 15 years.

J. Osborne Johnson, Director of Industrial Arts for the Denver Public Schools, gave a comprehensive report with contrasting and provocative ideas on the industrial approach in his system, largest in the state.

Very little goes on in the mass production area. Where it does, only a small segment of the process is represented—usually the division of labor aspect. Johnson pointed out that two aspects are necessary to make this industrial learning experience complete. They are: the making of standard interchangeable parts and the assembling of these parts into the completed unit, with a minimum of handicraft labor.

Everyone agrees field trips are a good thing but very few do much about it, and for good reason, Johnson declared, explaining that industry is in business to make a profit and not to provide schooling for young people. If all schools availed themselves of even a minimum number of educational trips, industry would be overly burdened. The school day is on a tight time budget and pupils cannot afford to miss other classes taking field trips.

Certification standards and economic conditions define what kind of background most teachers will possess. Few journeymen can afford to accept teaching assignments at the salary offered inexperienced teachers. In Denver there are over 100 full time industrial arts teachers. Only one completed an apprenticeship in an industrial craft.

Johnson said that in his system industrial arts teachers themselves are doing far more in first-hand study of industry. In Denver the local association is conducting a weekly seminar involving two-hour visitations to ten different industrial plants. The school district encourages this program by paying participants $3.15 per hour for the 20-hour seminar.

Mr. Johnson summarized very well for every individual teacher of industrial arts our question, "What is being done in the industrial approach?" when he said: "After years of continuous observation of teachers working with pupils I am convinced they do a superb job of providing (industrial) experiences."

In other words, the main factor in this area is still the attitude and skill of the individual teacher. The key to helping students become intelligently aware of their potential roles in industry, as well as the potential danger of increased automation, conformity, and loss of individual identity in a man-made physical environment, is the man in the industrial arts shops of our region and country.

Other interesting comments:

1. "The approach in the West should not be any different than in other parts of the country. If industrial arts is a part of general education, it should be the same all over."
2. "I do believe some of these new approaches: The Stout Plan, The Ohio State Study, The Stern *Functions of Industry,* The Man and Technology, or the manufacturing approach used in Evanston, Illinois, should be explored. These or a modification of them give a good insight into industry."
3. "We must stop this generalizing for four years. Advanced industrial arts classes should be geared to further occupational training."
4. "I am a firm believer in getting the student to understand basic processes, what happens to materials. With this understanding he should be able to adapt to the technological advance."
5. "The project can be used adequately to supplement the experimental approach in teaching the main areas of industrial arts. The project would probably be more meaningful in the lower grade levels."
6. "We must guard against pressures to make our program more like that of the T & I man. We must be equally alert to avoid too strongly flavoring industrial arts with science, economics, or technology."
7. "This business of reorienting the industrial arts program from project orientation to a study of industry in which the project is a secondary aim is a long hard pull."

J. Osborne Johnson, Director of Industrial Arts, Denver Public Schools.
L. L. Bibbons, Head, Industrial Arts Department, Colorado State University.
Kenneth F. Perry, Chairman, Division of the Arts, Colorado State College.
David L. Jelden, Professor of Industrial Arts, Colorado State College.
Ed C. Hein, Assistant Professor of Industrial Arts, Colorado State University.
J. M. Irwin, Instructor of Industrial Arts, Western State College of Colorado.
Clarence R. Svendsen, Assistant Professor of Industrial Arts, Adams State College, Alamosa, Colorado.
John L. Cameron, Director of Industrial Arts and Vocational Education, Colorado Springs Public Schools.
James Brown, Graphic Arts Instructor, Wasson High School, Colorado Springs, Colorado.
Doug Graff, Graphic Arts Instructor, William Mitchell High School, Colorado Springs, Colorado.
Wesley Ketchem, Graphic Arts Instructor, Palmer High School, Colorado Springs.
Paul Morin, Auto Mechanics Instructor, William Mitchell High School, Colorado Springs.
Homer Boyer, Department Head, Wasson High School, Colorado Springs.
Sherwin Powell, Department Head, Palmer High School, Colorado Springs.
Earl Gentry, Department Head, William Mitchell High School, Colorado Springs.
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Report: West Coast States

DURY A. FOX

Industrial Arts Consultant, Renton Public Schools
Renton, Washington

Realizing my responsibilities representing in this program five western states, namely California, Washington, Oregon, Alaska, and Hawaii, I wrote letters to state departments and city department heads . . . and read current industrial arts publications, books and periodicals on the subject. I was amazed to discover voluminous articles which revealed the ingenious methods that have been and are now being used in programs throughout the country to interpret industry and to integrate industrial methods and knowledge into industrial arts.

Depending on the background and enthusiasm of the individual industrial arts teacher, industry is being recognized in some manner by most of our schools in the far western states. Undoubtedly the California industrial arts programs lead in this respect.

How to inerpret, integrate, or in some manner get industry into industrial arts has been one of my concerns. Before discussing special programs that now exist it might be well to look sharply at this business of interpreting industry to young people. Does industrial arts, as it is taught today, interpret or integrate industry? If it doesn't, can it be changed so it will?

When we think of the industrial complexes in the country today such as General Motors, telephone and telegraph, aircraft companies (such as Boeing, Lockheed, North American) and U. S. Steel, for instance, what is there about these giant companies that we can impart intelligently to our students? Segments of industry are becoming so highly specialized and automated that most people now employed do not understand it.

Industry might be thought of in terms of research and development, production and manufacturing, sales and distribution. It is further complicated by including such areas as management and labor, quality and production control, performance analysis, procurement, inspection, and others.

Realizing the varied and complex nature of industry the question immediately arises, do we want to teach all aspects of industry or do we wish to confine our efforts to the design, production and manufacturing phases?

Many industrial arts teachers, according to recent reports, are making noble attempts in some manner or other, to relate industry to industrial arts. Most of this effort has been concerned with the production and manufacturing phases of industry and little has been devoted to the departments of research, sales and distribution, management and labor, performance analysis, quality and production control, procurement of supplies and equipment. It is rather obvious at this point that there has been little more than experimental teaching in this area. Most teachers realize an obligation here, but are frustrated in their token attempts to do a job.

If it is important to teach industry, and I think it is, then the what, the why, and the how, of modern twentieth century industrial technology must be spelled out in the industrial arts curriculum. Teacher education institutions must take the responsibility of providing future teachers with sufficient background to teach this important aspect of industrial arts. Industrial work experience is an invaluable part of a teacher's capability. Curriculum materials and facilities must be furnished to each department. If the teaching of industry is important then it should become as much a part of every program as the bench and the vise. I will attempt to relate a few general ways in which our schools are integrating and interpreting industrial methods and know-how with industrial arts, and then describe a few special programs from Washington State that seem to have merit.

First, and certainly most common, is the method of organizing laboratory activity on an industrial basis. This involves a shop organization paralleling production, with personnel structure, assembly line, quality control, inspection, packaging and perhaps sales.

Second, the method of orienting new students to the program in much the same manner as new employees are introduced into a company plant. Safety, personnel practices, accident insurance, work regulations, benefits, restrictions, all would be included.

Third, a thorough study of industrial safety programs, relating them to the school situation. Films, resource people, and voluminous printed materials are readily available.

Fourth, industrial visitations. Industries are becoming more cautious about encouraging student visitations. The matter of liability seems to be their greatest concern. Industry prefers a small, select group of students rather than a large unwieldy group. Teachers seem to be welcome, especially if in small numbers. The Business-Industry Education Day, a tradition in many communities, seems a popular method of acquainting teachers with industry. This is a thoroughly planned, well-organized day in which students take a holiday from school and teachers visit businesses and industries. On a follow-up day representatives from business and industry visit the schools.

Fifth, industrial trade shows, expositions, conferences, museums of science and industry. Since few schools provide time for such visitations, teacher participation in such activities is voluntary and the degree of influence is dependent upon the enthusiasm and dedication of the teacher.

Sixth, industrial resources available for classroom use:

a. Industry-sponsored films
b. Publications
    (1) Company bulletins, annual reports, technical publications
    (2) Professional societies and industrial institute publications such as reports, journals, data, books, etc.
    (3) Independently published periodicals and journals
    (4) Resource people
    (5) Charts, photographs
    (6) Industrial products, samples, etc.

Seventh, inservice classes (more on this later).

Eighth, industrial advisory committees, especially for occupationally-oriented classes.

A few programs from Washington State may be of interest. First is the purpose and some of the results of the work done by a *technical drawing advisory committee.* Membership on the committee represented four school districts and three industries employing many engineers and draftsmen. The purpose of the advisory committee was to evaluate high school technical drawing classes in order to determine what was being taught, what should be taught, and what shifts in emphasis should be made in order to update the program. It was not the intent of the committee to formulate a course of study, or in any way to organize a priority of units from beginning to end, but rather to attempt to determine areas of technical drawing requiring the greatest amount of immediate attention to upgrade teaching techniques which will more closely meet the needs of industry.

The meetings of the advisory committee were devoted to exploration and did not deal with any single topic, unit or subject in depth. The study indicated that most units covered in the high school technical drawing classes were adequate but there was a need for evaluation and updating. The committee did feel, however, that some areas needed to be changed. In the general area all students should be given the opportunity to participate in exploratory technical drawing classes, but they should evaluate future requirements before participating in depth.

The committee recommended that equipment and materials used should be evaluated for updating. This included reproduction machines (blueprint) and materials. Industry recommends that most drawing be done on tracing paper or vellum. Drafting machines, while convenient, offer too little learning to justify their high cost. Templates and other aids have frequently been avoided by many instructors but are recommended by industry.

Drawing units now being taught, such as blueprint reading, shop processes, electrical drafting, mathematics (descriptive geometry), sketching, lettering and line work, and the types of drawings submitted should be closely scrutinized for possible change in emphasis.

Second, an unusual *inservice training program,* which has aided Tacoma industrial arts teachers to upgrade their teaching skills and knowledge and also relate industry to their teaching, has been offered by the Tacoma Public Schools since the fall of 1960. Leadership and guidance to initiate the program was provided by the curriculum coordinator and the chairman of Tacoma industrial arts teachers. Class sponsorship and graduate and undergraduate credit were provided by Western Washington State College located in Bellingham, Washington, a distance of about 120 miles.

Because of the fact that local colleges and universities do not offer on-campus industrial arts courses, the program is heavily subsidized by the Tacoma School District through the Department of Extended Education. Tuition cost to teachers has varied from a minimum of $4.00 to a maximum of $25.00 for three-quarter college hours of credit.

Classes are held after school or during evening hours once each week for ten weeks. Public school facilities are made available for each class. Instructors for the classes are provided by the college with teaching assistants from the local school district. The assistants are men teaching in the district whose major capabilities are in the area of the class offering. Most teacher assistants have the educational equivalent of one year of college work beyond the master's degree. Teaching assistants are paid by the Tacoma Public Schools at the approximate rate of $6.00 per hour. Class enrollment has varied from 25 to 30 students. Class offerings to date have been:

Electricity-electronics (3)
Arc Welding (1)
Oxy-acetylene welding and cutting (1)
Industrial arts design (1)
Machine shop (1)
Plastics (1)
Philosophy of industrial arts (1)
Industrial technology (current offering)

The inservice training program has provided an opportunity for teachers to upgrade themselves in areas affected by technological changes. The classes have also provided an opportunity for industrial specialists to present new industrial processes, new materials, and new machines and tools, all of which has helped to broaden horizons and enrich teachers' backgrounds.

Third, a pilot course, requiring the coooperation of industry and entitled "Field Experiences in Industrial Education," was offered last summer (1965) by the University of Washington for industrial arts teachers. The university course (2½ quarter hours credit) began June 21, 1965, and ran through July 21. Mornings were devoted to classroom instruction on campus. Ten graduate students and their instructor, Dr. Athol R. Baily, spent 14 afternoons visiting industry.

Course description: "A study of problems of industry, such as employment practices, job requirements, plant organization and management, that would assist industrial arts teachers to interpret industrial practices to the students in the classes."

Prerequisites: (1) Teaching experience in industrial arts; (2) permission of the instructor.

Objectives of course: (1) To develop an appreciation of industrial design, good craftsmanship, appropriate materials, and sound construction to help trainees select and judge the products of industry. Develop safe work habits. (2) Help students assess their abilities, interests, and potentialities for preparation and employment as technicians, craftsmen, designers, inventors, scientists, industrial education teachers, and engineers. (3) Develop an understanding of industrial occupations, their opportunities, requirements and working conditions, for the educational and vocational guidance of youth. (4) Develop an understanding of major manufacturing processes in American industry.

Industrial management personnel accepted the responsibility to assign members of their organization to: (1) Discuss the unit's jobs and skill requirements. (2) Explain educational needs in fulfillment of the job position. (3) Allow a period of guided work observation. (4) Close the session with a question-and-answer discussion. (5) Arrange escort for guests from work area to entry gate.

A total of 14 visits were made to industry, ten to Boeing, and one each to U. S. Plywood Corporation, Isaacson Iron Works, Bethlehem Steel Company, and the Redmond Lumber Company.

The fact has been established that industry is being recognized by industrial arts in the far western states. We can say with some degree of certainty that American industry is here to stay. We cannot say the same for industrial arts unless a realistic curriculum is developed which includes industry as a vital part of the program.

In conclusion: Industrial arts teachers, supervisors, directors, and consultants are admonished to keep communication lines open.

The responsibility for including the teaching of industry cannot be left up to the individual industrial arts teacher. Modern technology, in all its implications, must become a permanent part of the curriculum which permeates industrial arts offerings at all levels. ■

Assisting Industrial Arts Teachers On Up-To-Date Educational and Career Guidance Material

Chairman: T. Gardner Boyd

Presentation: Overview of the 1965 Council Program on Guidance

Mr. Boyd pointed out the plans of the Council which include the preparation of a guide on guidance, to be printed in the very near future in two forms. After editing, possibly at the next meeting, the guide will then be published.

Presentation: Inter-Relationships of Industrial Arts to Other Subject Matter
Mark Jones, Tulare County Dept. of Education, California

Presentation: Requirements in Other Fields that Implicate Industrial Arts
Donald J. Ingraham, Arlington County Public Schools, Arlington, Va.

Presentation: Cultural, Civic, Occupational, Professional, and Avocational Values of Industrial Arts Education
M. J. Ruley, Tulsa Public Schools, Tulsa, Oklahoma

Recorder: Karl F. Jacobson, California State Dept. of Education, Sacramento, Calif.

Hosts: Carl G. Bruner, Wichita Public Schools, Wichita, Kansas
James O. Gillilan, St. Louis Public Schools,
St. Louis, Missouri
William T. Kelly, School District of Philadelphia,
Philadelphia, Pennsylvania

Program No. 8

Relationship of Knowledge and Skills in Each Area of Industrial Arts to Occupations and Professions

The material developed in these work sessions will be developed into usable form for the Philadelphia Convention meeting of ACIAS. The areas included were:

- Auto Mechanics-Power Mechanics
- Crafts, Industrial
- Drafting
- Electricity-Electronics
- Graphic Arts
- Metals
- Woods

All Moderators and Recorders were present except the people assigned to the Drafting Area. Dr. Shriver Coover served as Moderator and Jay D. Helsel substituted for the recorder. Each area was attended by approximately 25 people. ■

Requirements in Other Fields that Implicate Industrial Arts

DONALD J. INGRAHAM

Supervisor, Industrial Education, Arlington County Public Schools
Arlington, Virginia

The theme of this session, "Assisting Industrial Arts Teachers on Up-To-Date Educational and Career Guidance Material" is set. I was puzzled when I tried to relate to the theme the topic, "Other Fields That Implicate Industrial Arts." Webster helped me more clearly define certain words in the topic and change my first perception of the topic meaning.

Requirement, I found is a "requisite or condition." Condition, then, becomes one of the key words in the topic. Field has many connotations and most applicable is "a sphere of activity or opportunity." There also become key words. Implicate, I found to mean, "entwine or involve." We now have, the conditions in a sphere of activity which entwine or involve industrial arts.

First, what are some of the conditions? It appears to me there were, over a hundred years ago, some words written and spoken which described a condition of that time and aptly do describe a condition of our time which influences today's education:

". . . Conceived in liberty and dedicated to the proposition that all men are created equal . . . testing whether that nation or any nation so conceived and so dedicated can long endure . . that government of the people, by the people, for the people shall not perish from the earth."

These words, I believe, have formed a basic tenet vital to our heritage. Today, throughout the world, we find that our nation is being tested in upholding this tenet. Our nation, in defense of this tenet, is placed in the position of developing and producing hardware for our protection, trying to advance the humanity of the world and further develop our culture through the education of our people to the wise use, selection, and care of our material things and ideals.

This condition has placed our total educational program in a quandary as we ask, "Where shall the emphasis be placed on education?" Shall we concentrate more upon the advancement of the education for the technologies which have as a final result better hardware for our protection? Shall we concentrate upon the development of world humanity? Shall we concentrate upon the advancement of our culture? Or can we educate for all of these ideals?

Compounded to these broad world conditions are, by comparison, many minor internal conditions. Let's review, pausing long enough to name and not discuss in detail some of these conditions. How do we provide for students the ways for them to assimilate the vast amount of new knowledge that is being discovered each day? What are the socio-economic implications of automation? What are the material and psychological effects of electronic data processing on our people? Are changes in the world of work causing us to become a nation of haves and have-nots, and in turn, fomenting social unrest? What are the economic effects caused by the number of women entering the labor force? How will we cope with the growth in our populace? What are the effects caused by the mobility of our people? What are all the implications caused by the high percentage of our people under 25 years of age? How can we meet and educate for the increased demands of our people for more leisure time, and the things, places, and activities to enjoy this leisure time? Probably most frightening is the possibility of Huxley's world coming true with the recent developments in the field of bio-cybernetics.

Added to these conditions is the fact that we, as a nation, have committed ourselves to provide for the education of all of our people. Education today, like life, starts at birth and continues until death.

Let's quickly review some of the groups, if I may use the term groups, that we are to educate; the creative, gifted, so-called average, below average, slow-learner, retarded, physically handicapped, under-privileged, very young, youth, elderly, re-educate the unemployed, and you may add other groups.

The conditions are about us. What sphere of activity in education do we presently have to cope with these conditions?

The one-room school has been virtually replaced by consolidated or central schools, and even some of these newer plants have been replaced by campus schools, clusters, or satellite layouts. Within these newer plants are broader curricula, offering several levels of studies to the students of various abilities. These new plants provide the places and activities for learning we did not enjoy, magnificent libraries (and a library today is not just so many stacks of books), planetarium, science, mathematics, foreign language, art, industrial and vocational laboratories, which we at the age of sixteen could not have envisioned. Instruction in some instances is provided through educational television, shortwave radio stations are used for teaching foreign languages; and outdoor laboratories are provided for science instruction or for the total emersion by the student in a foreign language.

Administration is changing within these plants, to schools within schools. Administrators are making better use of department chairmen, educational secretaries, resource librarians, and there are numerous other innovations.

Staff is changing and our role as supervisors is to help bring about some of these changes. Staff is becoming more knowledgeable about human growth and development, the learning process, newer teaching methods, and better use of programed instruction. Staff is developing teams for teaching, experimenting with and demanding better and several kinds of audiovisual instructional materials. Staff is finally recognizing and providing for the individual student differences as they encourage flexible scheduling and independent study by students. The facilities of diverse departments are being interchanged and used as never before.

How then does industrial arts become entwined in the condition and sphere of activity? What is to be the place and future entwinement of industrial arts in the total education program?

Kimball Wiles told us at last year's convention that sweeping curriculum changes are brought about by outside groups. These groups promote their ideas; and appearing as experts, have them approved and adopted by school boards. Teachers briefly rebel, but quickly accept the ideas and label them as "great innovations." Will we accept new ideas from other groups, or shall we propose our own ideas?

From readings, observations, a recent survey conducted in my state, student demands and administration pressures, our local industrial arts staff has formulated some ideas and developed some practices which we believe may provide better education for students.

1. We found from our survey that in the junior high years strong emphasis should be placed on the industrial arts activities and teachings that provide the student opportunity to learn more about himself and help him to make a self-appraisal.

2. We found from the survey that in a continuing program, grades 7-12, there should be provided, in the later years, opportunity for a student to develop some vocational skills.

3. Many communities are providing a program which greatly involves industrial arts for those youth with special socio-economic needs. Included in the plan are workshops to educate and develop compassionate teachers to understand and have empathy for these children.

4. More programs need to be developed and properly staffed for the slow learner, the retarded and educable children. The activities provided in the industrial arts labs can be most helpful to these programs.

5. We have sensed that some senior high students are demanding the facilities and instruction whereby they may learn and apply a highly technical body of knowledge. Prime is the development of a course in "pure electronics."

6. We found that the students enrolled in the rigorous high school pre-engineering curriculum usually have not had time in scheduling to enroll in a drafting program. These students are now enrolled in a drafting course as a fifth or sixth subject, for the express purpose of preparing for the college freshman drafting achievement test which, if passed, will excuse them from further college drafting. We have planned and implemented this pre-engineering drafting course. At the other end of the scale there is in the planning stage a blueprint reading-drafting course for the slow learner.

7. Throughout our county there has been growth in the total summer program. It is being perceived differently now than in the past years. It is now thought of as a time for new work or enrichment. Industrial arts staff is planning for this summer the use of their facilities, not specifically for industrial arts courses, but for the activities the student enjoys and which will enrich his total learning experiences. Example: "Car Care, Dollars and Sense," "Slot Car Racing" and "Electronics for Communications."

8. Organized in a high school general shop is a course, "Commercial Design." Two classes are scheduled during the same class period, one in the art room and the other in the general shop. Classes alternate daily. While in the general shop the students learn the feel for and develop a sense of knowing materials which helps them to better understand functional design. This total experience enriches and gives more meaning and purpose to commercial design.

9. We have planned a research and experiment course for the highly creative twelfth-grade student who is either a science or mathematics major. These students will pursue through independent study a development of their ideas for which they have a great curiosity. The facilities of a comprehensive general shop will be used. The instructor will serve as a resource person. The activities will be correlated among the three departments.

10. We are planning a new junior high school with an enrollment that could adequately be supported by two industrial arts laboratories. A third general shop laboratory is planned. This third lab will be staffed by an industrial arts instructor. The lab and instructor will serve as a resource center for the school. This facility may be used, for example, by the art students desiring to cast metals, or perform welding sculpture. Math students experiencing difficulty in visualizing three-dimensional objects may fabricate them in the lab. Science students may use the lab to fabricate scientific apparatus. Home economics students may be pro-

vided short courses in home mechanics. Lack of imagination is the only limitation for the use of this lab.

11. We are questioning, "Do all drafting students need to spend the same length of time in a drafting program?" Can we devise a method whereby the student would be given a course outline and then come to the instructor for consultation, additional assignments or have his plates corrected? This would permit the student to study at home or during his leisure, and progress at his own pace. Actually this is another method for independent study.

12. We are questioning, "Can the junior high science unit in basic electricity be taught better in the industrial arts lab than in the science laboratory?"

13. We are investigating if the driver-education program can be enriched by providing for students a block of time to attend the power mechanics laboratory where short courses would be taught for understanding the functions of the major automotive components.

14. Only at the idea level is discussion centered about the use of a wooded piece of land for an outdoor science and foreign language lab. The building and trades classes would design and erect shelters, dining halls, picnic tables, and further develop the site. This experience would not only provide a practical experience for the boys but would provide another instructional facility for the schools.

15. We are questioning, "What is the future additional use and purpose of the industrial arts lab in the adult education and recreation programs?" Some vocational and avocational programs are presently in operation.

16. We are investigating the feasibility of providing the general shop facilities part time for students in a modified science program. These students usually are not able to cope with abstract ideas and require concrete experiences which can be better provided in a general shop.

All the aforementioned are addendum to the industrial arts curriculum and have been presented in the belief that they will, in part, help to strengthen existing programs for the present youth to become better informed, intelligent, functioning, worthwhile citizens of their local, state, national, and world community of 1975. ■

The Development and Accreditation of Doctoral Programs in Industrial Arts Education

The Nature of Doctoral Programs in Industrial Arts—What the Profession Believes

DELMAR W. OLSON
Kent State University
Kent, Ohio

What do we who are in the business of offering graduate study to the industrial arts profession think of our handiwork? This question was in need of answer as this writer wrestled with an idea for a better total program of graduate study than is now available. Consequently a list of 27 questions calling for frank, considered responses was prepared and sent to 60 colleges and universities throughout the nation. Each institution offered graduate study leading to a master's degree in industrial arts. All institutions offering a 6th year specialist's program were included as well as all of those offering a doctoral study for industrial arts students. This report summarizes and highlights some of the particularly pertinent responses from the 100 replies received from 120 questionnaires. The deductions indicated are by no means inclusive nor conclusive. They are a reading of the pulse and perhaps the blood pressure of some of our industrial arts teacher educations. The study is the first phase of a comprehensive inquiry into graduate education being conducted at Kent State University. The following questions and responses are drawn from the questionnaire. The reactions are merely observations made by the writer.

1. Question: In which: industrial arts, education, or other area should advanced degrees for industrial arts be given?

   Response: Master's level—78% favored industrial arts
   6th Year—61% favored industrial arts
   Doctorate—53% favored industrial arts

   Reaction: The profession may now be ready for a Ph.D. in industrial arts. The same question asked in 1960 brought a 5:1 response in favor of education.*

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*Report of an opinion sampling by Dr. Delmar W. Olson, Chairman, Department of Industrial Arts and Coordinator of Graduate Studies, Kent State University, Kent, Ohio. April 1, 1966.

2. Question: Should a thesis or dissertation be required?
Response: Master's—40% recommendation
6th Year—53% recommendation
Doctorate—85% recommendation

3. Question: Where should emphasis be placed in the three levels:
Response: Given in rank order—

	Master's	6th Year	Doctorate
Technical proficiency	1	5	5
Teaching proficiency	2	3	3
Scholarship	3	1	1
Leadership	4	2	2
Research	5	4	4
Authorship	6	6	6

Reaction: Apparently emphasis on scholarship should begin at the 6th year. The low esteem accorded authorship may account for the dearth of industrial arts professional literature. Perhaps it is true that we are not verbal as a group. If so, this is undoubtedly causing us many problems.

4. Question: Should graduate credit be given for shop-type courses?
Response: In percentage of total credit—

	Master's	6th Year	Doctorate
Range:	5-80%	0-80%	0-70%
Most frequent:	50%	50%	0%
Mean:	36%	33%	19%

5. Question: Should graduate credit be given for laboratory courses requiring research?
Response: In percentage of total credit—

	Master's	6th Year	Doctorate
Range:	0-80%	5-80%	0 70%
Most frequent:	20%	10%	10%
Mean:	27%	27%	24%

Reaction: Shop work for graduate credit has appreciable acceptance even on the top level. In the 1960 study referred to previously the opinion was 3:2 against on the doctorate and opinion unanimously favored graduate credit for technical research. One can ask a very logical question. Since industrial arts subject matter is technical, should it not comprise a major part of the curriculum on all three levels? In other disciplines this is the practice.

6. Question: Should industrial experience be prerequisite to the receipt of a graduate degree?

Response:

Master's	6th Year	Doctorate
Yes 23%	Yes 28%	Yes 30%
No 77%	No 72%	No 70%

7. Question: Should teaching experience be prerequisite to receipt of a graduate degree?

Response:

Master's	6th Year	Doctorate
1-2 years	2-3 years	3-5 years

Reaction: While the inventory revealed that technical competence was of major importance in graduate study and while co-op education with industry ranked highest in recommended unconventional features in the graduate program, it appears that industrial experience should not be required. An element of inconsistency prevails. Note the following question.

8. Question: Should graduate credit be given for industrial experience?

Response: Percentages in terms of total approval—

	Master's	6th Year	Doctorate
	Yes 45%	Yes 44%	Yes 21%
	No 55%	No 56%	No 79%
Range of credit recommended:	5-33⅓%	2-33⅓%	1-30%
Most frequent recommendation:	10%	10%	10%
Mean:	16%	12%	11%

Reaction: While the opinion is almost a toss-up on the first two levels, the idea is soundly vetoed on the doctorate. This suggests that the terminal program reflects a decidedly different philosophy of education. However, this is debatable in light of responses to other questions. Perhaps the strong objection on the doctorate is to credit, not to the experience.

9. Question: What is the No. 1 problem or issue in today's industrial arts graduate education?

Response: In order of frequency—

Master's

(1) Opportunity for specialization in technical subjects (32%)

(2) Securing capable candidates (11%)
(3) Producing master teachers (1%)

6th Year

(1) Inclusion of technical courses (28%)
(2) Too many required courses outside of field (9%)
(3) Insufficient research and experimentation (9%)
(4) Securing capable candidates (7%)

Doctorate

(1) Producing researchers (18%)
(2) Lack of technical knowledge (17%)
(3) Worthlessness of doctoral researches (13%)

10. Question: What is the single most needed change in today's industrial arts graduate education?

Response: In order of frequency—

Master's

(1) Increase depth in technical courses
(2) Provide instruction in new technologies
(3) Provide research experience

6th Year

(1) Provide more opportunity for technical specialization
(2) Include leadership, supervision courses
(3) Include more research experience
(4) Include fewer education courses
(5) Design programs to meet needs of students

Doctorate

(1) Provide more emphasis on research
(2) Design programs to meet needs of students
(3) Include more laboratory courses
(4) Provide more leadership training

Reaction: It should be kept in mind that these recommendations are coming from professors and reflect soul searching on their part. In the writer's opinion the recommendations as a group are signaling the change to come.

11. Question: Should an undergraduate degree in the following be acceptable for graduate study on the master's level?

Response:

	Yes	No
1. Industrial technology	91%	9%
2. Trades and industries	82	18
3. Engineering	67	33
4. Physics, Chemistry	40	60

5. Fine arts	32	68
6. Mathematics	31	69
7. Vocational agriculture	26	74

Reaction: The response makes for an interesting situation. We are one of few disciplines which would accept a second discipline as appropriate background for undergraduate study. Does this mean that industrial arts is not really a discipline? That undergraduate preparation in industrial arts is so liberal and general in nature that there is no discipline to it? That trades and industries and industrial arts are essentially equivalent, or possibly that trades and industries provides a superior undergraduate background? Since industrial technology grew out of industrial arts teacher education and is usually found in the same department, an affinity is logical. However, with the overwhelming acceptance shown, one might be prompted to ask whether or not it is a superior technical preparation for industrial arts teachers.

12. Question: What unconventional features would you include in a graduate program of industrial arts?

Response: Forty different features were proposed. Those with the greatest frequency were—

Master's

(1) More technical courses for specialization
(2) Cooperative education with industry
(3) More experimental laboratory courses

6th Year

(1) Cooperative education with industry
(2) Provision for experimental research
(3) Training in administration

Doctorate

(1) More experimental research
(2) Cooperative education with industry

Reaction: While the preceding may be unconventional, perhaps the following are even more so:
(1) Courses in the "Great Books"
(2) Courses in industrial psychology
Note that a strong call is being made for experience in experimental research. This suggests that a critical review of graduate research problems and procedures may be in order. The emphasis on cooperative education was unexpected. It may suggest that the respondents are recommending such experience as the most feasible

means for acquainting the student with contemporary industry and strengthening him in the technical. The need for the latter is evident throughout the returns.

13. Question: What is the greatest single weakness of men in the profession who have earned the doctorate?

Response: Of the 25 indicated these two were most common—
(1) Lack of practical, technical experience
(2) Never seem to get back to earth

14. Question: What is their greatest strength?

Response: Of the 19 included these two were most common—
(1) They demonstrate qualities of leadership and aggressivenes
(2) They exhibit professionalism and pride

15. Question: Which should receive the greatest emphasis: creativity, knowledge, technical mastery?

Response: Opinion favored knowledge at all three levels. At the master's and 6th year, technical mastery was second in importance. At the doctoral, creativity was second to knowledge, and technical mastery, third.

Reaction: If on the undergraduate level also creativity receives no greater emphasis, here may be the explanation for the little progress in curriculum development in a half century.

16. Question: What are your recommendations for improving the thesis and dissertation experience?

Response: 33 were given. The following in the order of frequency were dominant—
(1) Should be more practical, realistic
(2) Should allow student more freedom of choice
(3) Should de-emphasize questionnaires and surveys
(4) Should emphasize research and research methods
(5) Should include better supervision, more assistance from supervisors

Reaction: We are probably telling ourselves that the experience should be more real and meaningful, that it should make a significant contribution to knowledge, and that we prefer them to be usable by others.

17. Question: Is there an equivalent to the doctorate among the qualifications for college teaching in industrial arts?

Response:

55%	"No"
19%	"Yes"
26%	Undecided

18. Question: What percentage of total credit should be given in industrial arts?

Response:	Master's	6th Year	Doctorate
Range:	20-100%	20-90%	10-80%
Average:	72%	58%	49%
Most frequent recommendation:	50%	50%	50%

Reaction: The responses bear out a previously indicated concern that graduate study has included too many requirements outside of industrial arts. They lend support to the earlier preponderant recommendation that in graduate study the degree be given in industrial arts.

19. Question: Indicate the preferred level or levels for the following courses.

Response: These are given in frequency rank—

Master's	6th Year	Doctorate
(1) Curriculum construction	Independent technical research	Teacher education
(2) I-A for junior high	American industry	Research methods
(3) Laboratory shop planning	Organization & administration	Comparative education
(4) Teaching methods	Research methods	Independent professional research
(5) I-A for senior high	Laboratory, shop planning	Contemporary problems, issues
(6) History of I-A	I-A in general education	Technical writing
(7) Evaluation	Teacher education	Independent technical research
(8) American industry	Evaluation	Organization & administration
(9) I-A in general education	History of technology	History of technology
(10) Science (physics, chemistry)	Independent professional research	I-A as liberal arts
(11) Organization & administration	Mathematics	Evaluation
(12) Mathematics	I-A for junior high	I-A for elementary school
(13) Research methods	I-A for senior high	I-A in general education
(14) Independent technical research	I-A as liberal arts	Curriculum construction
(15) Technical writing	Teaching methods	History of I-A

Reaction: Interestingly the purposes of the three degrees are clearly evident. We see the master's level as essentially for preparation of a master teacher, not as a research degree. The master teacher we would convert to a technical specialist and the latter to a teacher educator. ■

The Recruitment of Future Industrial Arts Teachers

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Industrial arts education, as a well established and vitally important curriculum area, has been affected by the general thrust toward curriculum improvement. Concerned as they are with industrial processes, products, materials, and occupations, industrial arts personnel are increasingly aware of the growing gap between industrial reality and its representation in the total educational program. More particularly, it has become quite evident that many of the traditional approaches to industrial arts education are incapable of providing students with an adequate understanding of the impact of industry upon our man-made world and upon industrial personnel.

New curriculum designs have been proposed, and some experimental programs have been initiated. These have met with mixed acceptance and success. It is generally recognized that the central question involved in bringing about a major change in industrial arts education is the question of instructional content. That is, in view of the dynamic and complex character of modern industry, what are the appropriate units of instruction in industrial arts? If traditional courses in metalworking, woodworking, and drafting are no longer appropriate to the task, what is?

The Industrial Arts Curiculum Project (IACP), a joint effort of The Ohio State University and the University of Illinois, with financial support from the United States Office of Education, has undertaken to develop a rationale to guide the conceptualization of a more adequate structure or framework for the organized study of industry. The project staff, consisting of professors and graduate research assistants from both institutions, is headquartered at The Ohio State University. It utilized the resources of both universities, as well as consultants from other academic, industrial, and professional organizations. A distinguished national advisory committee provided general guidance to the project. With its counsel, the project staff has developed a basic structure of the body of knowledge which it has defined as *industrial praxiology*. This can provide a sound basis for the selection of content for industrial arts for use at any level of the educational ladder.

With the essential elements of the structure developed, a process which required approximately eight months, the project staff then organized task forces of subject matter specialists to identify the major elements or subheadings which were needed to further detail the basic structure. These task force members were drawn from such substantive areas of industry as industrial design, industrial engineering, industrial psychology, and industrial organization and management. The project staff drew together the products of the task forces into a document which, together with an opinionnaire, was then sent to leaders in education such as state and local supervisors, school administrators, teacher educators, and industrial arts teachers. Based on the reactions of this professional peer group and the advisory committee, a revised draft of the paper was prepared. The results of this developmental effort were disseminated through distribution of the basic document and through lectures at selected colleges and universities. Feedback from these dissemination procedures assisted the project staff in further refining the proposed structure for the content of industrial arts.

At the conclusion of this phase of the project, it is anticipated that additional funds will be forthcoming to advance the work into implementation phases. Syllabi will be developed for the various educational levels, starting with programs in the junior high school. Instructional materials such as textbooks, laboratory manuals, supplementary readings, models and demonstration devices, and other teaching aids will be developed to form a complete educational package. During the development of these materials, field trials will be held in the public schools of Cincinnati, Ohio. The new program in industrial arts then will be introduced in selected experimental centers throughout the nation, with in-service workshops and curriculum consultants from the project staff aiding the local teachers and administrators. A thorough evaluation of these experimental programs will be conducted.

Summer institutes for teachers will be held parallel to the field testing of the materials. It is expected that a pre-service collegiate teacher education program will be designed to provide future industrial arts teachers with the new orientation and the requisite knowledge and skills.

The Industrial Arts Curriculum Project undertook the systematic development of a structure for the body of knowledge from which instructional content can be derived. If this total effort is successful, industrial arts as a curriculum area will have a cohesive, comprehensive, and internally consistent framework from which students can draw meaningful insights into that complex and productive societal enterprise—modern industry. The benefits of such insights in terms of enlightened citizenship, educational-occupational guidance, and integration with the culture and the world of work would indeed be substantial.

It is the intent of this presentation to explain the rationale which has been developed by the staff of the Industrial Arts Curriculum Project (IACP) for structuring the body of knowledge of industrial arts. It should be added that this rationale is tentative, and the hope is that this presentation will stimulate professional concern for this problem.

From the beginning, three assumptions as to the nature of industrial arts were made:

1. Industrial arts is a study of industry. It is an essential part of the education of all students in order that they may better understand their industrial environment and make wise decisions affecting their occupational goals.
2. Man has been and remains curious about industry, its materials, processes, organization, research, and services.
3. Industry is so vast a societal institution that it is necessary, for instructional purposes, to place an emphasis on conceptualizing a fundamental structure of the field, i.e., a system of basic principles, concepts, and unifying themes.

Further assumptions were made as the study progressed:

1. For purposes of analysis, man's knowledge must be categorized and ordered logically.
2. To provide for the most effective and efficient transmission of knowledge, the educator must codify and structure disciplined bodies of knowledge.
3. The structure of a body of knowledge can be developed before the total curriculum is designed.
4. All domains of man's knowledge must be included if an effective general educational program.

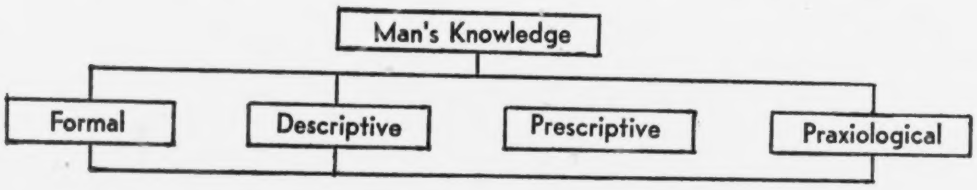
In carrying on the project, these assumptions dictated a search to determine if there is an identifiable body of *industrial* knowledge and, if so, its structure.

To adequately structure a body of knowledge requires that: 1) the context must be defined, i.e., the boundaries or limitations must be established; 2) the elements must be identified in a meaningful order; 3) the sum of the elements must equal the context; and 4) the relationships between elements must be discernible.

Industrial arts education, by its very name, is a study of industry. Accepting this as a postulate, it follows then that the taxonomical question to be answered is, "What is industry?" In order to answer this question in a logical manner, it is necessary to ask another question: "Does industry have a body of knowledge?" This question in turn leads to the most fundamental question of all: "Into what divisions might man's total knowledge be categorized?"

The Structure of Man's Knowledge. Attempts to classify or categorize the vast body of accumulated and recorded knowledge are difficult, since there is controversy as to the nature of knowledge and because knowledge is always in a state of development. Man's knowledge may be conceptualized and ordered into four domains or classes as shown in Figure I (E. Maccia, 1965a).

Figure I
The Four Domains of Man's Knowledge



The first domain is formal knowledge. The established disciplines within formal knowledge serve as tools which are used to order all knowledge and, therefore, could be abstracted as form or arrangement (syntactics). Logic, mathematics, and linquistics are examples of such fundamental disciplines.

The second domain is descriptive knowledge. The key term that may be used to identify descriptive knowledge is "sciences." The sciences seek and establish facts about phenomena and events and describe their interrelationships. All of the disciplines that comprise the physical sciences, the biological sciences, and the social sciences represent descriptive knowledge.

The third domain of man's knowledge may be termed prescriptive knowledge. Disciplines within the humanities and fine arts seek to provide man with a system (or systems) of values—judgments as to whether phenomena or events ought to be—whether true and/or good and/or beautiful.

The fourth domain of man's knowledge, one which is rarely recognized, is praxiological knowledge. In the secondary school, courses in the practical arts and vocational education are attempts at organization of such knowledge. This domain is represented in higher education by the various professional schools and departments. Among them would be medicine, law, engineering, management, marketing, education, dentistry, dairy technology, pharmacy, and many others. These so-called applied or derived fields of knowledge draw upon the formal, descriptive, and prescriptive domains as *necessary* but *insufficient* background for full status in the practicing profession. Practice (or internship), *per se*, is necessary also for proper training; but, together with formal, descriptive, and prescriptive knowledge, it is not sufficient. These disciplines demand a clinical or professional body of subject matter. This body of knowledge is termed *theory of practice, knowledge of practice, or praxiology*—man's ways of doing which bring about what is valued or what ought to be through action.

The term "praxiology" comes from the Greek 'praxis' meaning *to do,* or the practice of an art, science, or technical occupation. The suffix 'ology', connoting a science or branch of knowledge, completes the full meaning: the knowledge of man's practices.

The case herein made for the recognition of praxiology does not imply any de-emphasis of the formal, descriptive, and prescriptive domains of knowledge. They form, however, only a portion of the base upon which the praxiological studies rest. In addition, the element of practical experience is critical. It must be pointed out that a "knowledge of practice" does not reduce the need for "knowledge" or for "practice." All three ingredients—1) *knowledge* (traditional knowledge of formal, descriptive, and prescriptive), 2) *knowledge of practice* (less traditional or less recognized knowledge), 3) *practice*—are necessary for a complete educational program.

Praxiology may be equated with technology only if one of the least common of several meanings of the latter words is used. Technology may be taken to mean "hardware," technics of operating hardware, a combination of the preceding, or "the science of the application of knowledge to practical purposes." Only in the latter instance is technology synonymous with praxiology. Thus, it is necessary to use the term praxiology rather than technology if the goal is to communicate precisely.

From the above, teachers, doctors, lawyers, mechanics, and farmers all are praxiologists. Few would class them all as technologists, and doctors themselves generally would not accept the label of technologist. Because technology has many meanings, the term "praxiology" serves better to convey a single meaning.

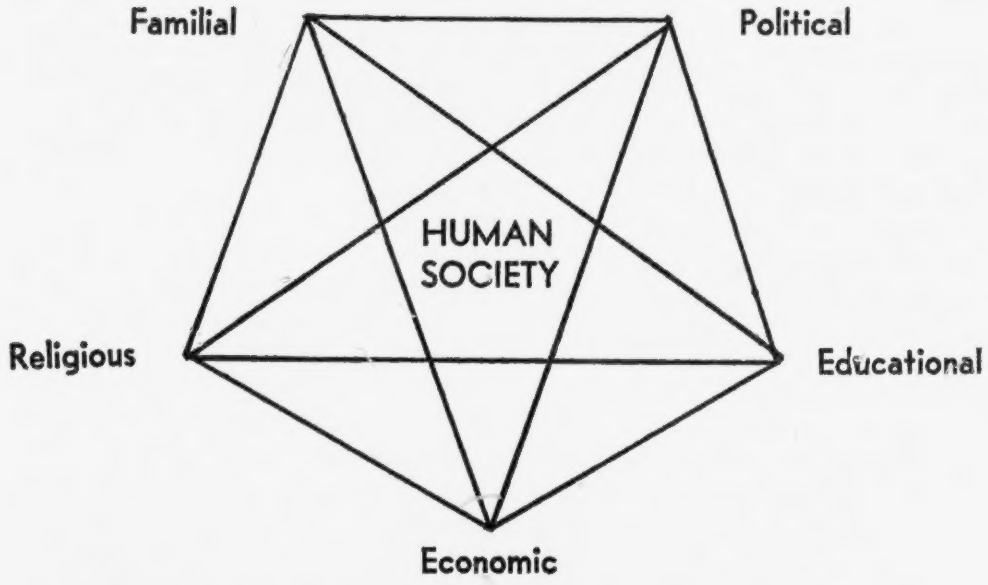
Development of Institutionalized Practice. Man's practices or patterns of action have developed as man himself has developed. As patterns of action have become formalized over the ages, fundamental social institutions have developed. Perhaps the most fundamental of primitive man's normative patterns of behavior was the institution of the family. The religious institution, with its evolving beliefs and practices, was also fundamental to early man. As society developed, the institution of the family was unable to accommodate all of man's practices.

Patterns relating to economic activity became formalized outside of the family. Relationships developed regarding government or politics as society became more complex. A formalized pattern of education has become more significant throughout the development of man and the consequent development of man's accumulated knowledge.

Cuber indicates that sociologists generally agree that the five fundamental social institutions of man are 1) familial, 2) religious, 3) economic, 4) political, and 5) educational (Cuber, 1951, p. 433) (Figure II).

Figure II

Basic Social Institutions



Assuming these five institutions are fundamental, they may serve as valuable constructs in conceptualizing man's practices. As in all categorization or classification schemes, these divisions are not precise since there are no sharp lines of demarcation and the functions often overlap. The interrelationships between and among these institutions are many.

Industry and the Economic Institution. To the layman, terms such as agriculture, business, and industry, taken collectively, grossly describe the field of man's economic activity. For purposes of more precise analysis, however, the elements of the economic institution must be more carefully conceptualized. A structure of the economic institution which lends intelligibility to its function is depicted in Figure III. Society has developed this particular institution to provide its economic goods, commonly divided into goods and services. This dichotomy is fallacious for the purposes of this project. Therefore, in Figure III, economic goods are divided into *material production* and *other economic activity.*

Even a casual review reveals that agricultural services are rendered by agriculture. To separate the practices of tree pruning or plowing from agricultural production because they are sometimes provided as services off the farm serves little or no function in communicating the theory of the practices. Similarly, to separate the practices of appliance repair from industrial production because they are sometimes performed in the home would serve no logical purpose in organizing the theory of those practices.

Services are provided by all the elements of the economic institution, thereby the term fails to qualify as a discrete category among the elements. As agriculture and industry provide services, so do banks, advertising agencies, and the schools. On this point, the *Standard Industrial Classification Manual* cannot be used for the purposes of this project. Some establishments do engage primarily in service, and, for purposes of gathering data relative to their economic significance, a service category for these data may be appropriate. However, on a logical basis, particularly with reference to the source and nature of the practices of servicing material goods, services are integral to the material production elements which develop and refine the service practices.

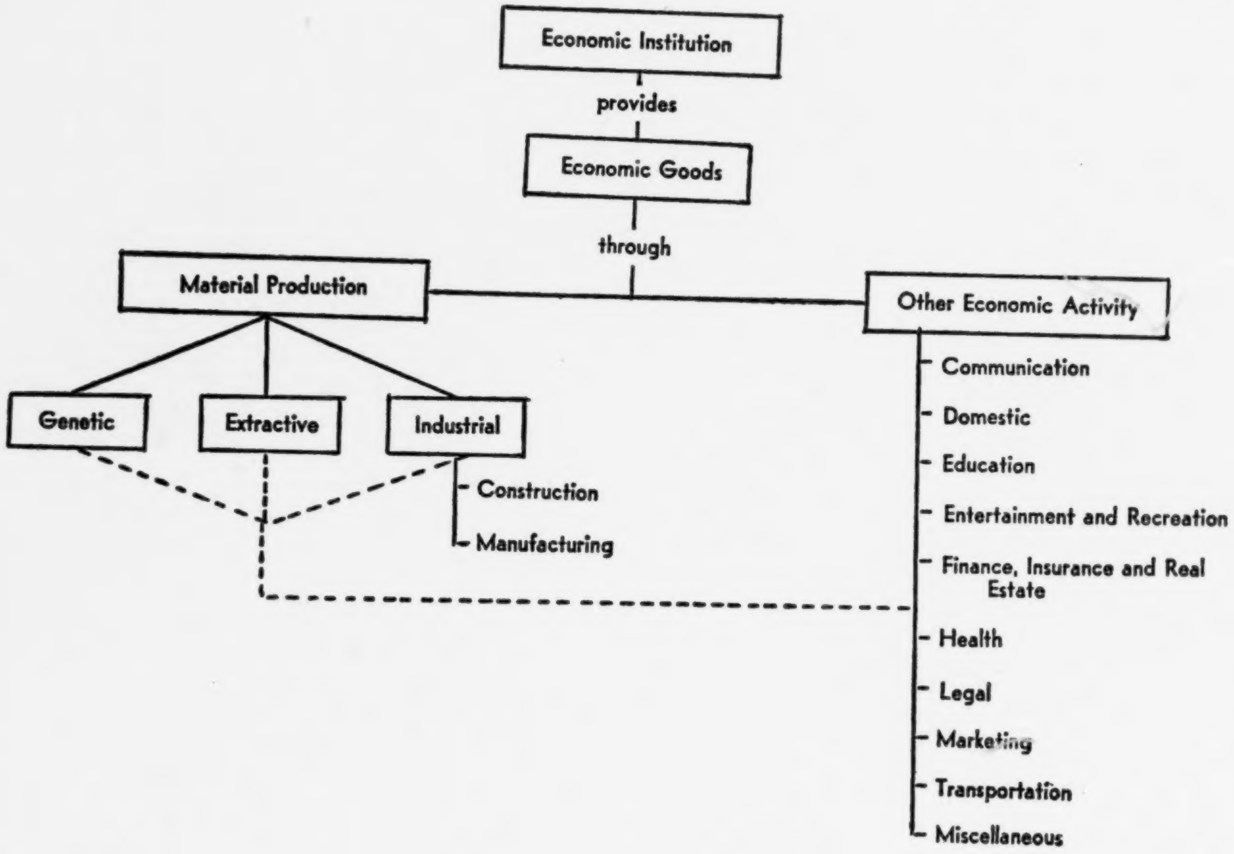
In view of the above, the term "services" does not appear in Figure III. The elements of the economic institution all are considered to possess service practices which appropriately are studied within the total context of each particular element. Thus, manufacturing and construction services are structured and would be studied as part of each respective element.

Within the economic institution *industry* may be conceived as being that institutional element which substantially changes the form of materials to satisfy man's material wants. Industry essentially includes construction and manufacturing. While agriculture and mining also are engaged in material production, they do not essentially change the form of the materials produced. For this reason, they may be designated genetic or extractive material production.

Utilities commonly are structured as separate categories or in conjunction with selected services. Utilities do not appear in this manner in Figure III. Rather, they are subsumed, in manufacturing or in construction, as they relate to material production. Thus, the conversion of coal to steam to kilowatt hours of power is a manufacturing function, as is the operation of a waste treatment plant. On the other hand, the building of manufacturing or sanitary facilities is construction.

Figure IV presents the material production continuum which clarifies the relationships between the elements of material production. The genetic or extractive material production of agriculture, forestry, fisheries, mining, etc. may either provide materials to industry (construction and manufacturing) which substantially change the forms of these materials, or their production may be provided directly to the consumer. For example, peas may be sold fresh to the consumer or be processed in industry and then be distributed to the consumer. Similarly, coal may be

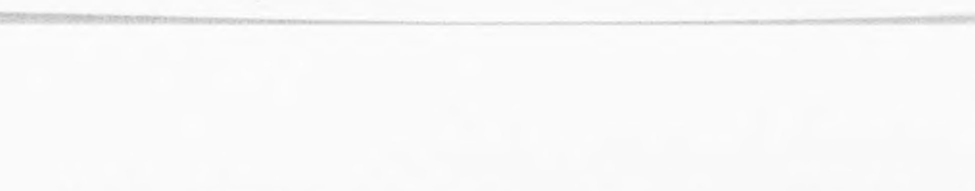
Figure III


Economic Institution
provides
Economic Goods
through
Material Production
Other Economic Activity
Genetic
Extractive
Industrial
Construction
Manufacturing
Communication
Domestic
Education
Entertainment and Recreation
Finance, Insurance and Real Estate
Health
Legal
Marketing
Transportation
Miscellaneous

provided directly to the consumer or it may be manufactured into briquets or converted to kilowatts and then passed to the consumer. Gravel may be provided directly to the consumer or it may be processed by manufacturing and construction to concrete and to a structure, respectively.

Industry does not provide services except as they are related to material goods. These material goods are serviced by installing, maintaining, repairing, and altering them. Industry also provides the body of knowledge used by those service establishments and individuals engaged in the servicing of material goods. That is, when industry produces automobiles or buildings, it provides the theory of practice for their efficient installation, use, alternation, maintenance, and repair by consumers, operators, and service men. Industry produces this body of knowledge and for this reason it is a part of the study of industry.

Figure IV
THE MATERIAL PRODUCTION CONTINUUM



In accordance with the above, a study of aircraft production, as part of a study of industry, would include all that is involved in producing and servicing aircraft. It also includes the development of operating practices and maintenance and repair practices. Industrial praxiology would not include a study of how an airline is planned, organized, and controlled or how it produces economic goods.

Only the practices employed in the management and the production of industrial material goods constitute the elements of the body of knowledge which is industrial praxiology. The subject matter of industrial arts should be selected from this body of knowledge.

In order to conceptualize the body of knowledge contained in industrial praxiology, a matrix approach has been devised as shown in Figure V. This approach provides a unique way of looking at the multi-dimensional elements of the body of knowledge. In the three-dimensional matrix approach, increasing levels of specificity may be added on one or any combination of the axes. If all three axes were developed, it would seem theoretically possible to select an almost infinite number of combinations from the matrix. The obvious advantage of this approach is the movement from the general to the specific.

Figure V, the first order matrix of industrial praxiology, indicates that industrial management practices combined with industrial production practices yield industrial material goods and affect humans and materials.

Subsequent figures separately categorize those practices which primarily affect humans and those which primarily affect materials.

For analytical purposes, the practices which affect human behavior must be separated from the production setting although it is clear that the electroplating process, for example, cannot be separated from concerns for exhausting noxious fumes properly and for providing proper protective shielding for workers. However, industrial health is a universal concern throughout the establishment, and this fact is evident only when its many related practices are placed within some meaningful, all-encompassing construct. Thus, the broadest generalizations about industrial practices to affect worker safety may be identified independently of their specific applications throughout the production environment, and they may not be recognized simply from a random sampling or even from a total assemblage of the vast array of specific practices throughout industry.

Figure VI depicts the second order matrix only of that portion of industrial praxiology which primarily affects materials. This follows the pattern introduced in the Figure V, except that Industrial Material Goods have been separated into Manufactured and Constructed Industrial Material Goods. A sample third order matrix is shown in Figure VII. The shaded area from Figure VI has been expanded in this figure to show that formulating, researching, designing, developing, and engineering are subelements under Planning; while site developing and structure erecting are subelements under Processing. At this level, Constructed Industrial Material Goods are divided into buildings and non-buildings.

A separate but parallel structure of industrial practices which affect human behavior in industry is shown in Figure VIII. These practices are Planned, Organized, and Controlled by management as it affects humans through its practices of: Hiring, Training, Working, Advancing (up, down, or out), and Retiring. These practices often are different in manufacturing and in construction. Their similarities and differences provide further insight into their nature.

It should be repeated that while one can look separately at industrial practices which primarily affect materials and those which primarily affect humans, their interrelationships in the production setting are at least as important as their separate entities. It is this latter fact which often is ignored when either type of practice is studied with disregard for the other, something the adequate industrial arts program should not do.

The matrix approach being used in this analysis provides a unique way of looking at the multiple dimensions of this body of knowledge.

Levels of specificity may be added to the model on all or on selected dimensions. It is possible, for example, to expand the "industrial production" axis to a high level of refinement, while retaining the

Figure V
FIRST ORDER MATRIX OF INDUSTRIAL PRAXIOLOGY

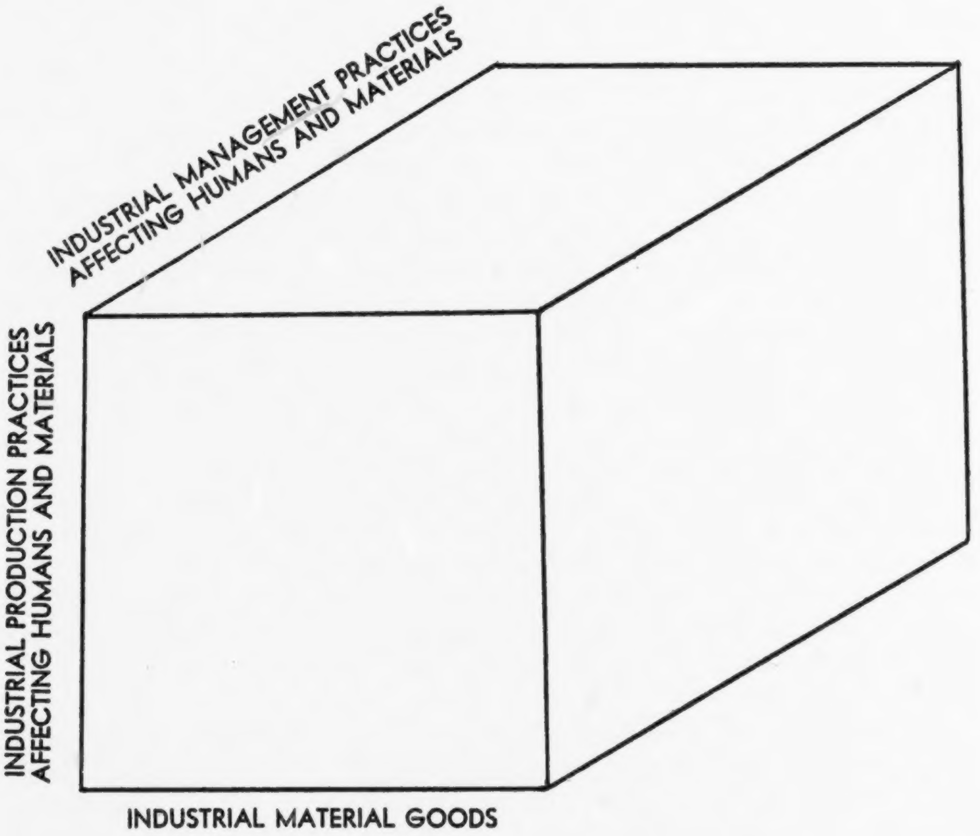

INDUSTRIAL MANAGEMENT PRACTICES AFFECTING HUMANS AND MATERIALS
INDUSTRIAL PRODUCTION PRACTICES AFFECTING HUMANS AND MATERIALS
INDUSTRIAL MATERIAL GOODS

Figure VI
SECOND ORDER MATRIX OF INDUSTRIAL PRAXIOLOGY AFFECTING MATERIALS

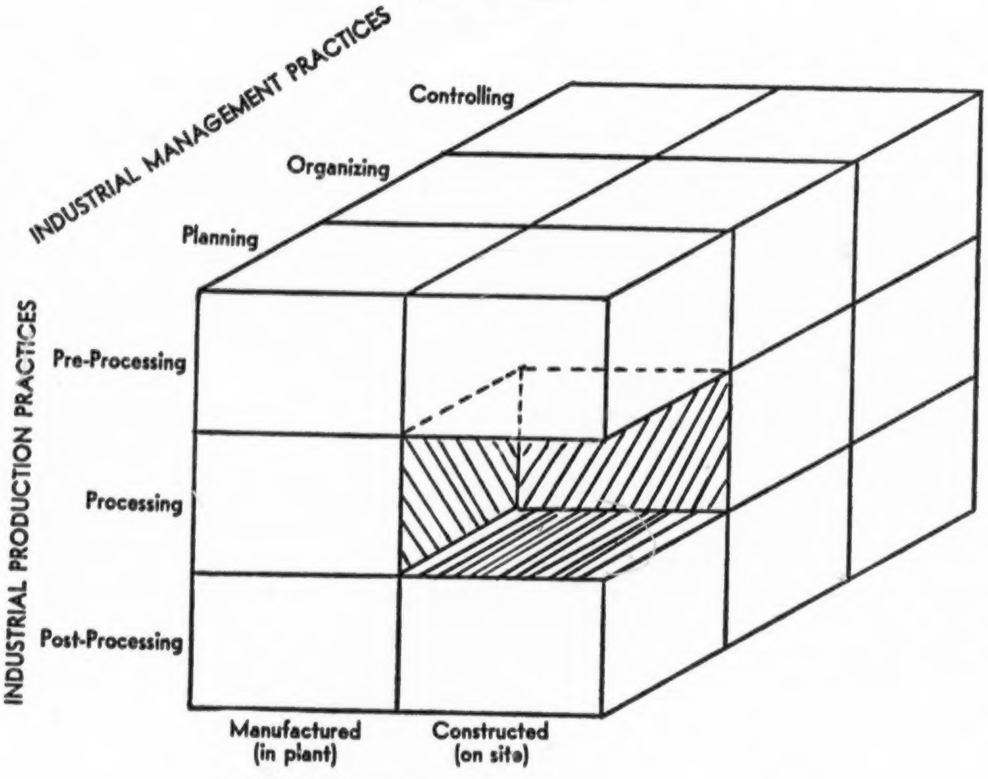

INDUSTRIAL MANAGEMENT PRACTICES
Controlling
Organizing
Planning
INDUSTRIAL PRODUCTION PRACTICES
Pre-Processing
Processing
Post-Processing
Manufactured (in plant)
Constructed (on site)
INDUSTRIAL MATERIAL GOODS

Figure VII
SAMPLE THIRD ORDER MATRIX OF INDUSTRIAL PRAXIOLOGY
AFFECTING MATERIAL

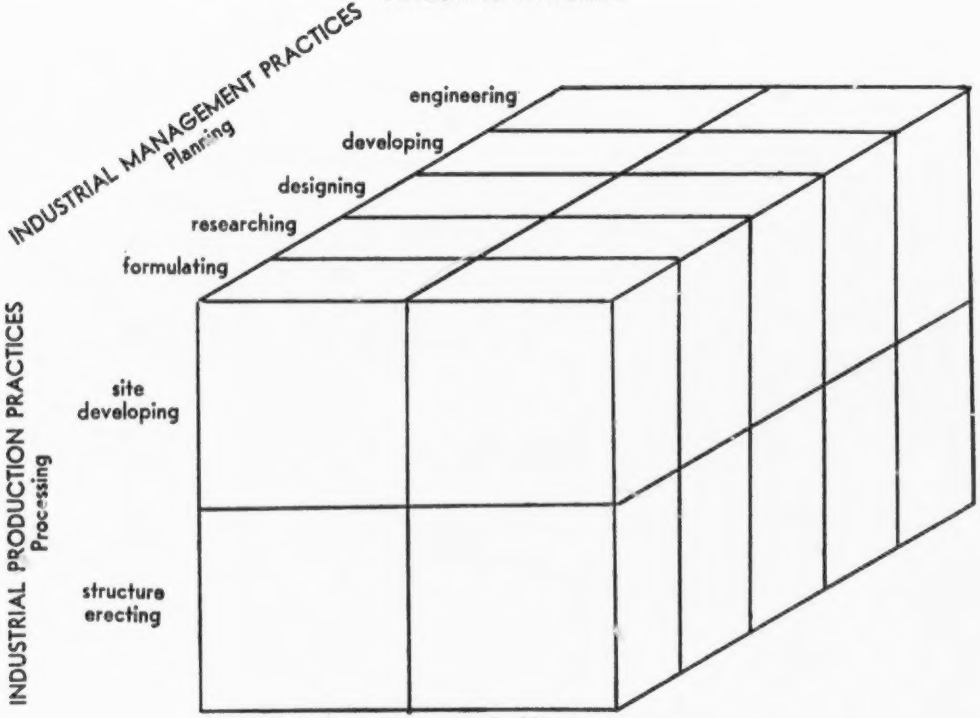
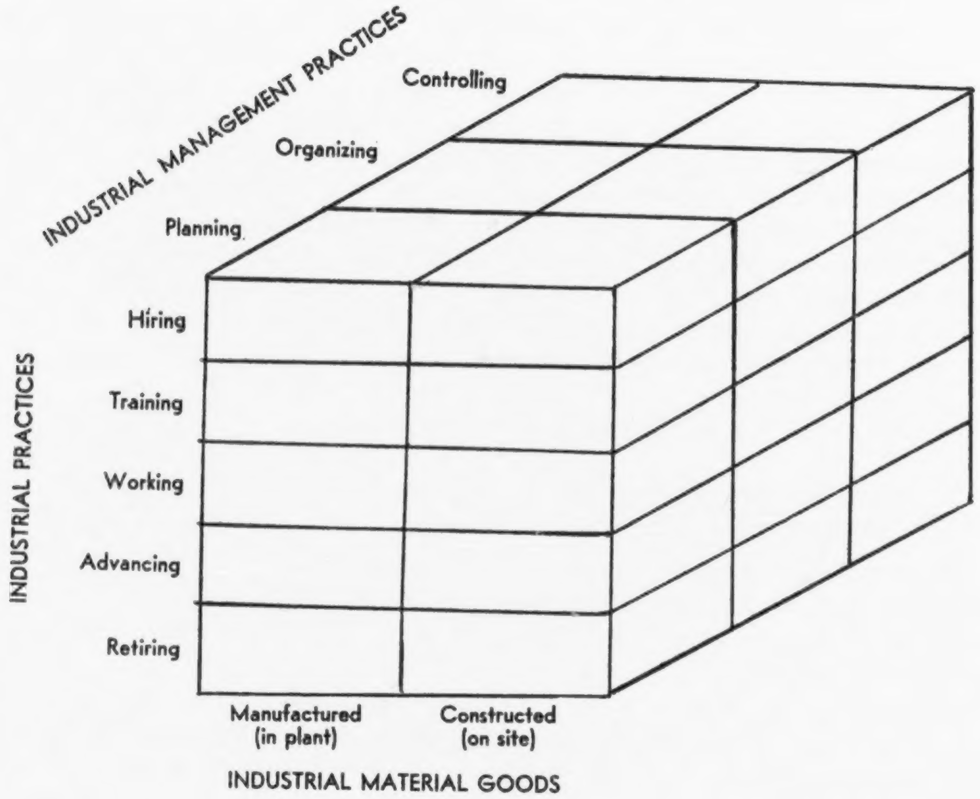

INDUSTRIAL MANAGEMENT PRACTICES
Planning
engineering
developing
designing
researching
formulating
INDUSTRIAL PRODUCTION PRACTICES
Processing
site
developing
structure
erecting
buildings
non-buildings
Constructed
INDUSTRIAL MATERIAL GOODS

Figure VIII
SECOND ORDER MATRIX OF INDUSTRIAL PRAXIOLOGY
AFFECTING HUMANS


INDUSTRIAL MANAGEMENT PRACTICES
Controlling
Organizing
Planning
INDUSTRIAL PRACTICES
Hiring
Training
Working
Advancing
Retiring
Manufactured
(in plant)
Constructed
(on site)
INDUSTRIAL MATERIAL GOODS

generality of the "industrial goods" and the "industrial management" dimensions. If all three dimensions were extensively developed, it would be theoretically possible to select an infinite number of "tailor-made" combinations of subject matter from the matrix. Thus, while the primary responsibility of the Industrial Arts Curriculum Project is directed toward industrial arts at the junior high school level, the principal analytical device (the matrix of industrial praxiology) has potential applicability at all grade and sophistication levels.

The possibilities for further development of the IACP Matrix along systematic and analytically defensible lines are indeed bright. The conceptual research must be continued in a disciplined, vigorous manner until the structure has been sufficiently developed to permit the content selection process to commence.

Concluding Statement. The Generalized Model of Industrial Praxiology presented must not be construed as the ultimate or definitive structure for the body of knowledge from which industrial arts subject matter is to be selected. After thorough and extensive research, it represents the most advanced and most promising conceptual construct that the Project staff has been able to conceive. Its tentative quality is openly admitted, as all conceptual schemes are subject to review, refinement, and modification. Additional investigations, experimentation, and eventual widespread implementation will assist in evolving this structure. The reliability and validity of the generalized model will be enhanced to the extent that curriculum workers can be mobilized for its development.

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